DEPARTMENT

# ROADS AND STREETS

MARCH, 1948 HIGHWAYS BRIDGES AIRFIELDS HEAVY CONSTRUCTION

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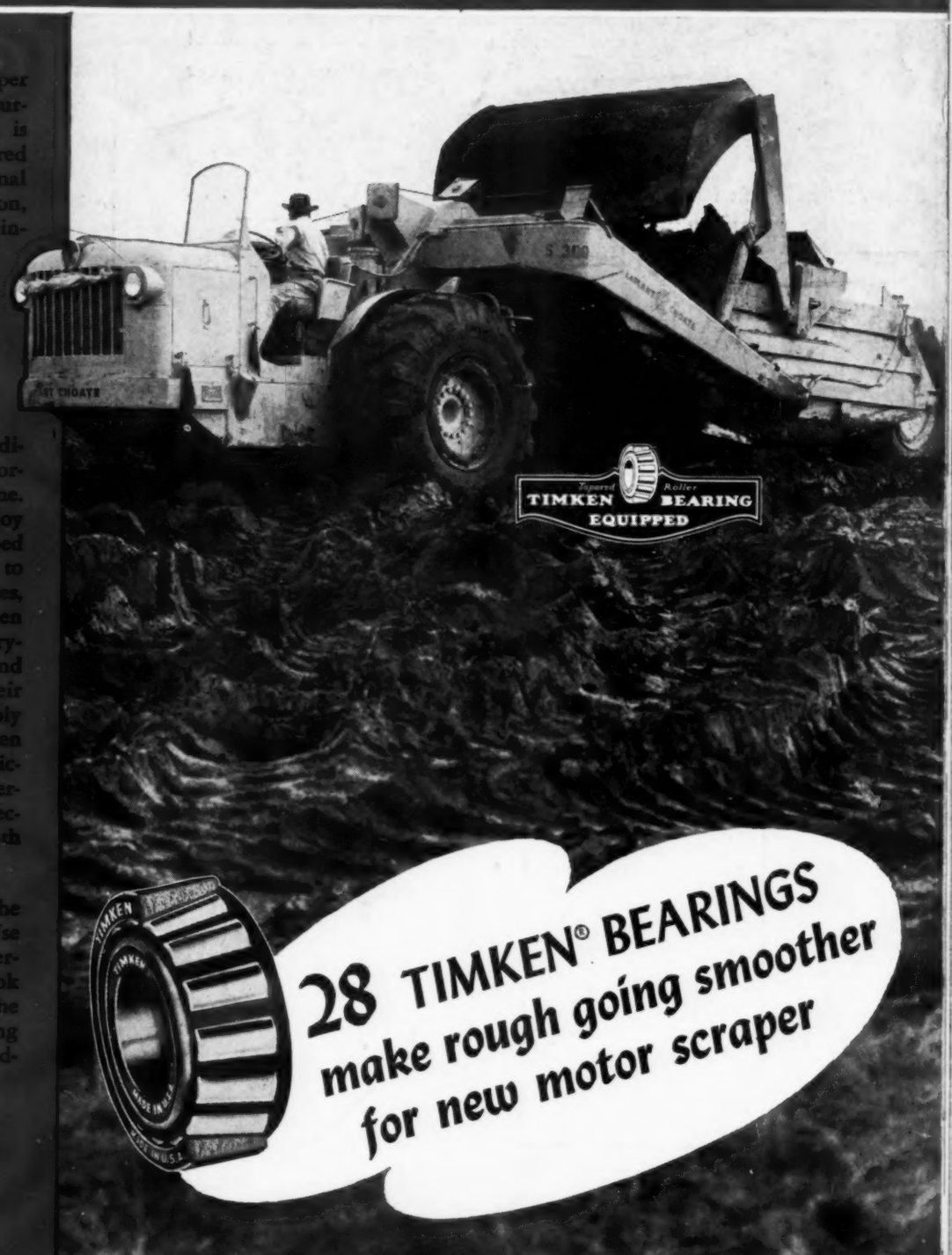
MAR 8 - 1948
DETROIT

The new high-speed motor scraper built by LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa, is equipped with 28 Timken Tapered Roller Bearings on drive axles, final drive idler gear, final drive pinion, differential mounting, spiral bevel pinion mounting, cable unit worm, cable unit worm wheel, cable unit, cable drum and scraper wheels. They hold moving parts in rigid alignment; insure a smooth, unretarded power flow; reduce gear and maintenance.

Even under the most rugged conditions, Timken Roller Bearings normally last the life of the machine. They are made of Timken Fine Alloy Steel — the finest steel ever developed for tapered roller bearings. Due to the line contact between rolls and races, and positive alignment of rolls, Timken Bearings have tremendous load-carrying capacity — take both radial and thrust loads *in any combination*. Their true rolling motion and incredibly smooth surface finish enables Timken Bearings to operate freely and frictionlessly. Timken Bearings also permit the use of closures which effectively retain lubricant, saving both maintenance time and material.

No other bearing can give you *all* the advantages of Timken Bearings. Use them on all your equipment, wherever wheels and shafts turn . . . look for the trade-mark "TIMKEN" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS




NOT A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL AND THRUST LOADS IN ANY COMBINATION

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

*so versatile, so easy to operate, so economical . . .*

## IT PAYS TO USE SCHRAMM!

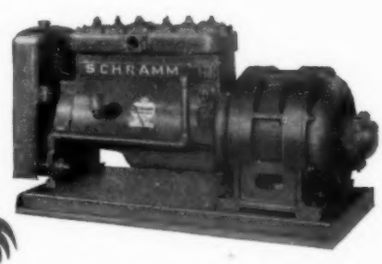
**VERSATILE** . . . because Schramm can furnish air for any compressed air job in your work; and versatile because there is a size and model Schramm to fit your individual needs!

**EASY TO OPERATE** . . . merely by pushing a button to start, and compact and lightweight enabling you to move the portable units wherever you like! Meanwhile, the stationary units take up very little room, are vibrationless and no trouble!

**ECONOMICAL** . . . because Schramm can do *all* your compressed air jobs quickly and efficiently. Features that assure economy include 100% water cooled, forced feed lubrication, and mechanical intake valve.

Your field has found that Schramm Air Compressors well fit its needs. And has specified Schramm everywhere . . . North, East, South and West. Write today for full data.

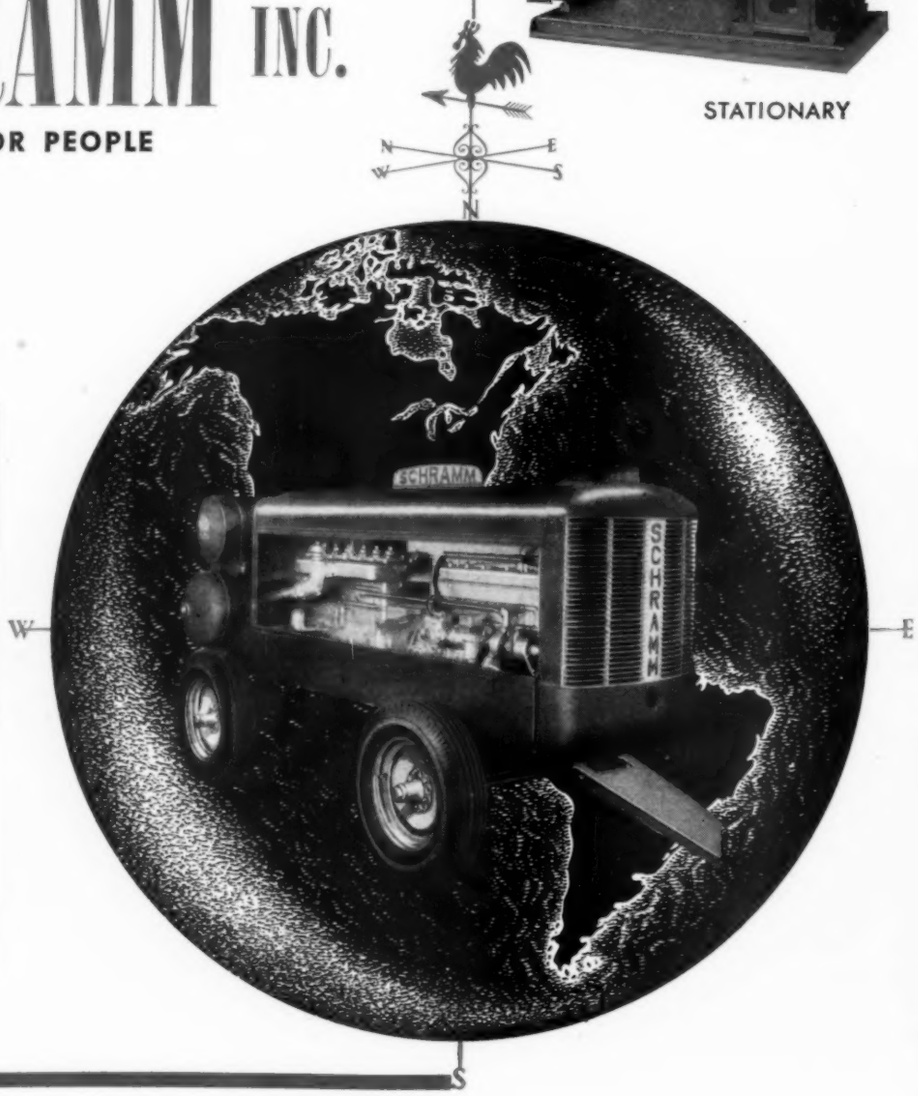
PORTABLE




STATIONARY

# SCHRAMM INC.

**THE COMPRESSOR PEOPLE**
**WEST CHESTER**
**PENNSYLVANIA**




## TOOLS *for the* JOB

Schramm Inc. also has a complete line of Pneumatic Tools to offer and recommend for operation by their Compressors.

These include Rock Drills, Paving Breakers, Trench Diggers, Clay Spades, Backfill Tampers, Tie Tampers, Sheeting Drivers, Demolition Tools, Chain and Circular Saws.

Write for bulletins and prices.

Pouring concrete over Bethlehem Reinforcing Bars, shown in place atop one of six culverts built for new road.

# Relocation Job in Northern New York

Pushing the mud around. Earth-moving equipment at work on grading for the new highway.

With strike-off completed, husky Bethlehem Bar Mat is moved into place. Job called for 62,000 sq yd of mats.

Close-up of screed as it spreads final course over Bethlehem Bar Mat.

Joseph Powers, junior engineer (left), and Austin Sarr, resident engineer, both of N. Y. State Highway Dept., glance approvingly at one of numerous construction details encountered on the job.

**New York's Route 56, well-known highway from the Adirondacks northward to Massena and the Canadian border, recently underwent relocation near the junction with Route 72, south of Potsdam. These pictures show phases of the construction along a 4¾-mile stretch of the new road built by Warren Brothers Roads Co., Syracuse, N. Y. Reinforcing bars and bar mats were furnished by Bethlehem.**

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
*Export Distributor:* Bethlehem Steel Export Corporation

**Leading Bethlehem Highway Products**

Road Joints • Reinforcing Bars • Bar Mats
Guard Rail • Guard Rail Posts
Wire Rope and Strand • Hollow Drill Steel
Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods

BETHLEHEM STEEL

## STEEL for HIGHWAYS

# ROADS AND STREETS

MARCH, 1948 • VOL. 91 • No. 3

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting


## Coming Articles

"Advance Snow Removal Plan Pays Off at La Guardia Field."

"Heater-Planer Used in Highway Widening."

"Sea Mules and Pontoons Help Set Steel for Mile-Long Bridge at Peoria."

"Experiments with Sod."

"How One Paving Crew in One Season Placed 457,000 Sq. Yd. of Concrete Paving."

"Moving 4,000 Yds. per Day—Mostly Rock" on largest road project in West Virginia history.

"Soil Problems in Texas Marl Belt."

"255,000 Cu. Yd. in 23 Days on Nevada Road Job."

—and many other useful and practical articles, based on nation-wide field travels by the R and S editors and including contributions by leading engineers, officials and contractor personnel.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.


**Gillette Publishing Company**
**Publication and Editorial Offices,**
**22 West Maple Street, Chicago 10, Ill.**



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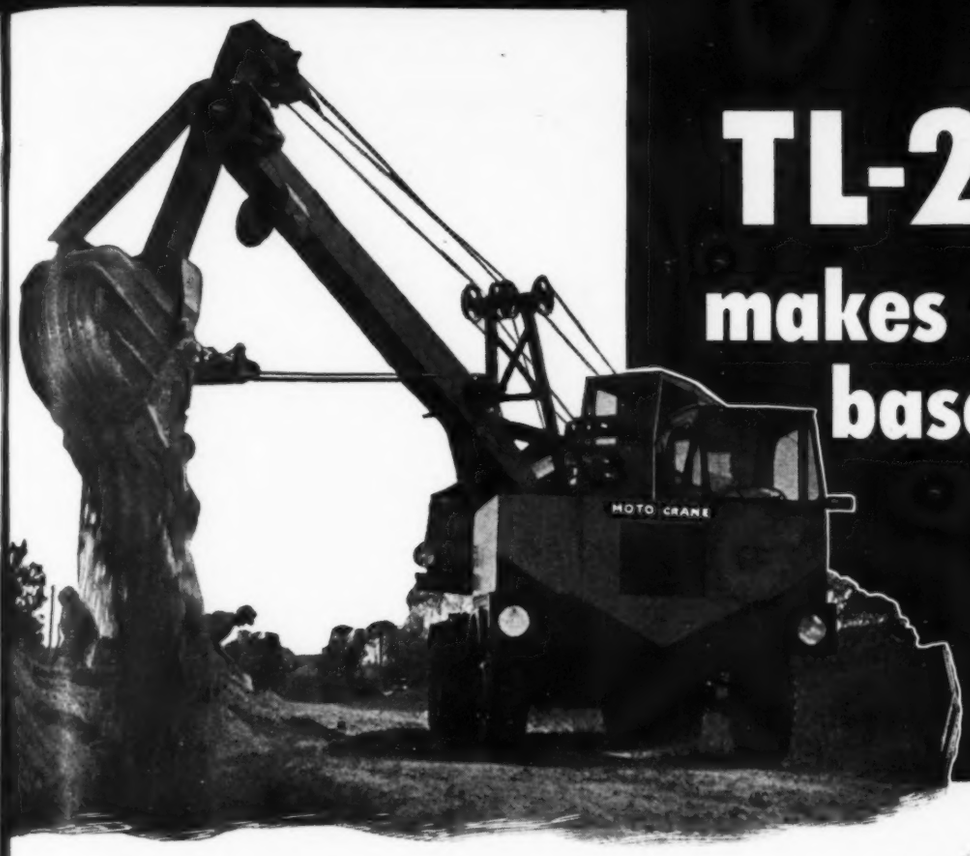
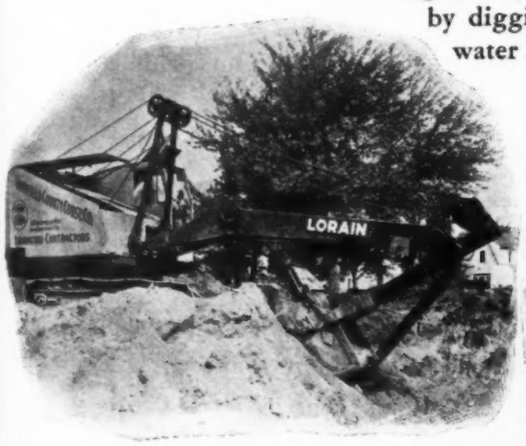
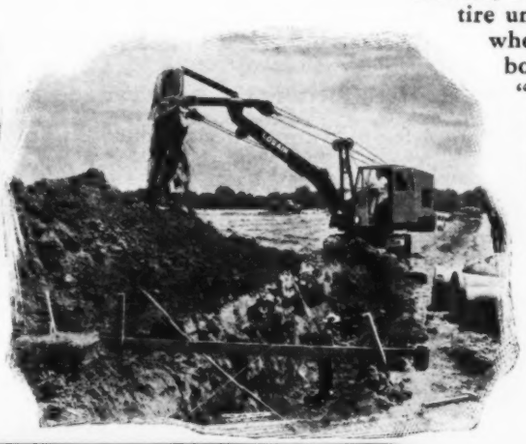



# TL-20 HOE
## makes trench and basement jobs
## HUM!

GOOSENECK boom for maximum digging ranges; ability to dig hard materials; close control of dipper for precision work—These Lorain TL-20 Hoe features make it a top flight operator on deep trench excavation for sewer, water and pipe lines.

And you should see the TL-20 breeze through those small basement jobs! Working from the top, without need for ramp, this unit (1) cuts straight vertical walls; (2) levels and grades the floor; (3) digs neat, sharp corners; (4) leaves little hand trimming and (5) tops off the job by digging sewer and water line connections.



The Lorain TL-20 Hoe offers a choice of mountings—2-speed chain drive crawler, 4 or 6 wheel mobile rubber-tire units with or without front wheel drive. Interchangeable boom equipment enables the "20" to switch to shovel, crane, clamshell or dragline operation in a jiffy. It's the most "versatile specialist" at work today—and you can get all the facts by asking your local Thew-Lorain distributor.

Reg. Trade Mark

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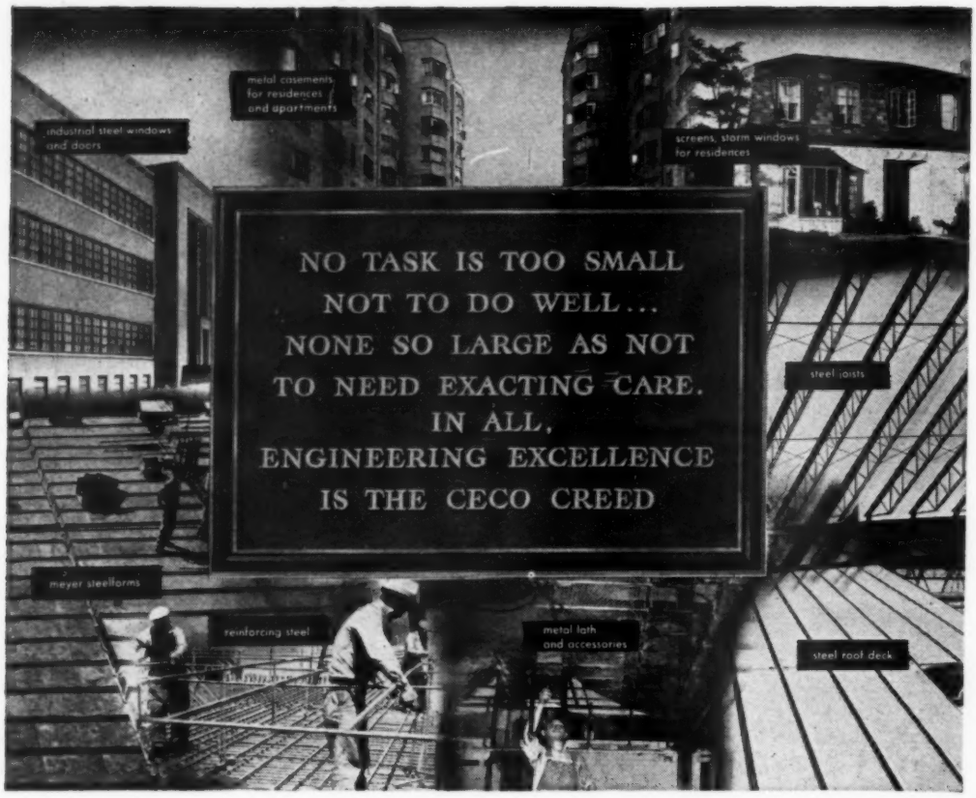



*An Attitude ...a Creed behind a company slogan...*

## "In construction products CECO ENGINEERING makes the big difference"

Thirty-six years ago an attitude, an ideal, started Ceco Steel Products Corporation. Today, that attitude, that ideal, is summed up in a Creed, which best describes the way Ceco and all its people have worked to build the company. No lofty phrases make up this Creed, but simple direct language.

Today the Ceco Creed puts into words what 36 years of practice put into action to dramatize the company's oft repeated slogan . . . "In Construction Products CECO ENGINEERING Makes the Big Difference." Actually, there are three types of engineering at Ceco:

**CREATIVE ENGINEERING.** Here there is the ceaseless and endless search for new and better ways to do things, for new and better products to simplify building . . . to provide short-cuts in construction methods.

**PRODUCTION ENGINEERING.** This type of engineering means the organization of work in manufacturing so that each process flows properly, merging individual jobs into the whole, for better manufacturing practices with the saving in time and, consequently, in costs.

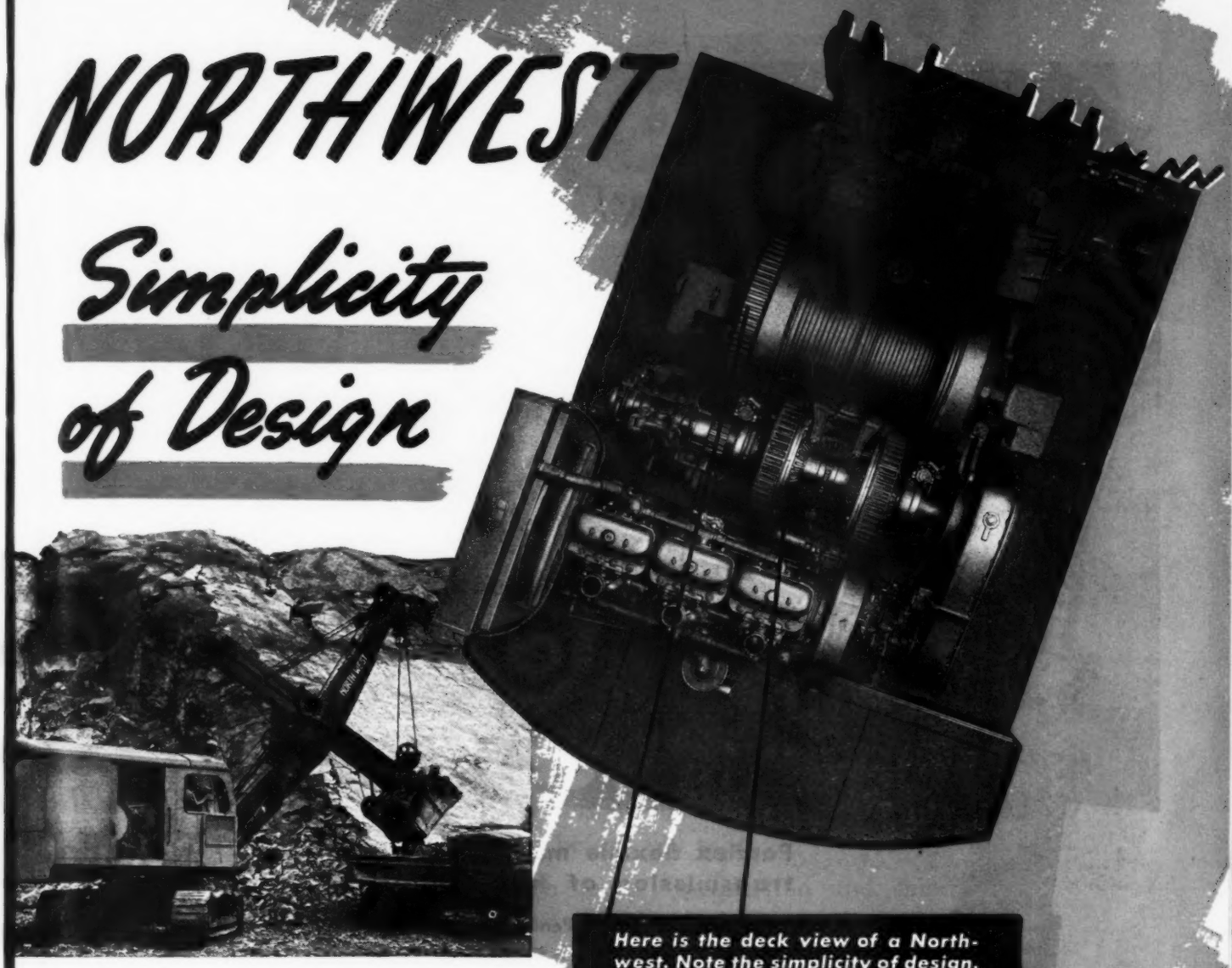
**FIELD ENGINEERING.** This is where Ceco Engineers test and prove the products they make . . . where product advantages are proved by practice . . . where in-the-field on-the-job data is developed so that the best way to use a product is discovered.

**CECO STEEL**

**CECO STEEL PRODUCTS CORPORATION**
**GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois**

# NORTHWEST

## Simplicity of Design



*Here is the deck view of a Northwest. Note the simplicity of design. There are only two main horizontal shafts and all assemblies are readily accessible.*

*Gears too, are few in number. Compare this with the complications of other machines. Simplicity means lower cost operation and maintenance.*

## Keeps costs down and profits up!

Design complications mean higher upkeep costs. Northwest simplicity assures easy maintenance. Look at the deck of a Northwest. Simple, isn't it? Only two main shafts, few gears, a direct line of power without complications. Everything *get-at-able*, easy to adjust, easy to maintain.

This is just one of the many Northwest advantages that make the Northwest a real Rock Shovel—another of the features that assures you the type of service you would like to have.

Ask Northwest Owners! There are *good* reasons why every third Northwest sold is a repeat order! Check on Northwest advantages and plan to follow the Northwest Crowd.

NORTHWEST ENGINEERING COMPANY
1504 Field Building, 135 South LaSalle St., Chicago 3, Illinois

*Follow the* NORTHWEST CROWD

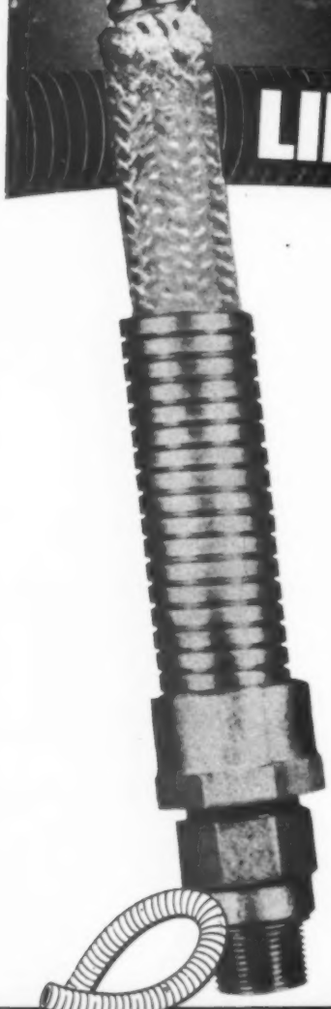
*Still the Standard toward which others build!*

*If you have a* REAL ROCK SHOVEL *you won't have to worry about output in dirt*

# NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

# LIFE LINE FOR TAR MIXERS



**Penflex flexible metal hose assures trouble-free transmission of hot tar for road surfacers**

**ON PAVING MIXERS, Penflex hose is ideal for free-flowing transmission of tar from tank trucks to mixer. Resists crushing, kinking, severe abrasion.**

**ON ROAD SPRAYING TRUCKS, precision-made Penflex offers tight, leak-proof service for filling tanks and for connection to spraying apparatus.**

**ON TAR AND ASPHALT HEATERS, Penflex hand hose, shown on left, prevents dangerous burns to operators using hand sprayers. Sturdy interlocked hose is insulated with heavy braided asbestos. Entire unit is encased by larger diameter hose with heat-proof couplings attached, assuring constant protection and safety.**

**48-HOUR DELIVERIES ARE OFFERED on the above items to meet emergency requirements. Call on Penflex for a complete line of flexible metal hose and couplings for efficient, long-lasting service plus helpful engineering assistance for the solution to your flexible tubing problems. Write today for Bulletin No. 91.**

**PENFLEX SALES COMPANY**
*Division of*
PENNSYLVANIA FLEXIBLE METALLIC TUBING COMPANY
7216 Powers Lane Philadelphia 42, Pa.
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*Penflex*... HEART OF INDUSTRY'S LIFE LINES

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# Don't sell your "Caterpillar" equipment until you are SURE you can replace it

IN this day of "sellers' markets" there are, no doubt, many who would like to buy some of your "Caterpillar" equipment—at an attractive figure.

But where would that leave *you?* Be sure you *know* before you sell.

Though factory production and shipments from coast to coast are greater than ever, the supply of most "Caterpillar" products is still many months behind demand.

Look at it this way: If your "Caterpillar" equipment is easy to sell, it must be profitable to keep. "Caterpillar" products, with their inherent high quality, are seldom so old or worn that they can't be given many additional hours of good service by overhauling or parts replacement. Your "Caterpillar" dealer can give you a mighty efficient job—at reasonable cost.

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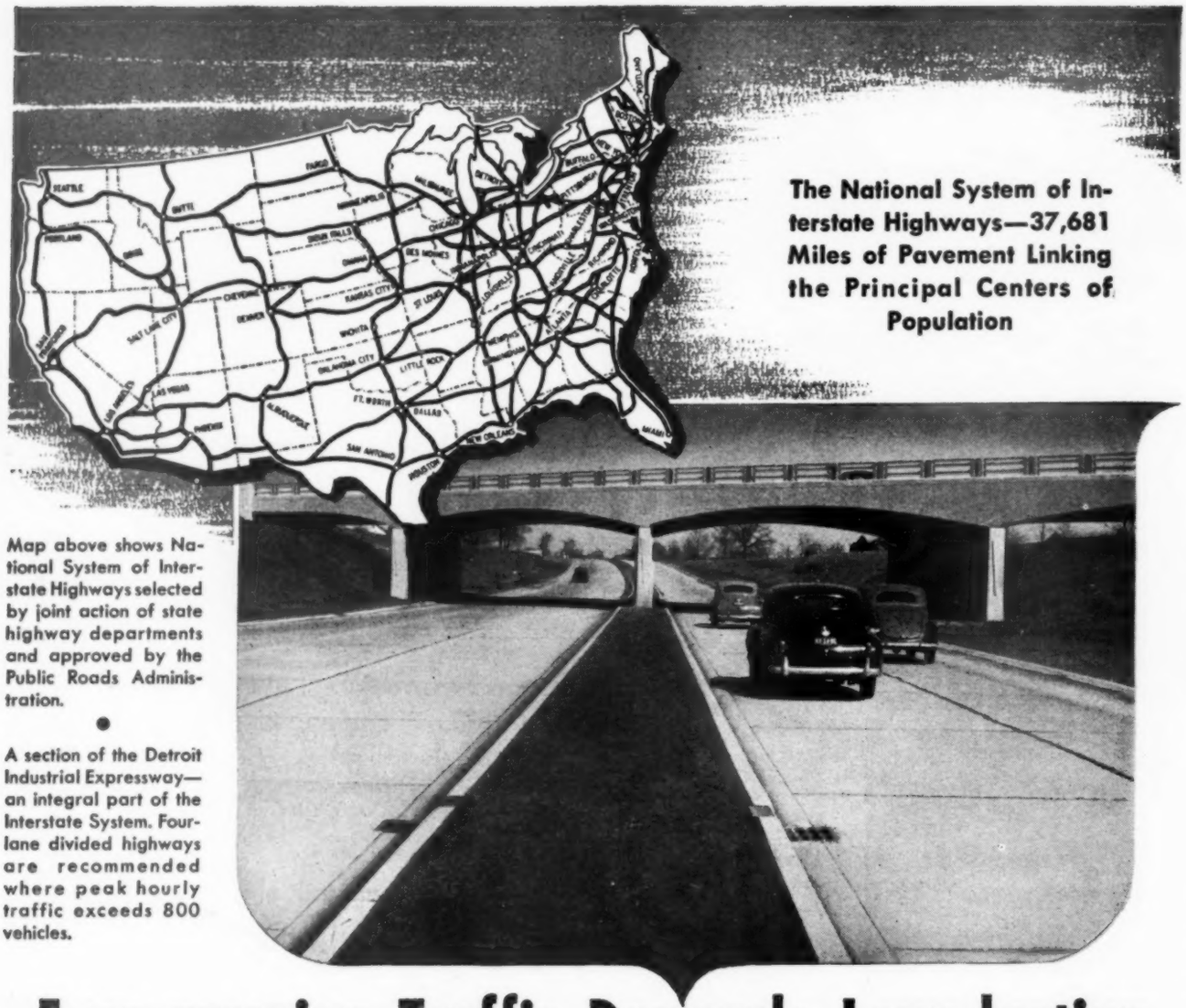


**The National System of Interstate Highways—37,681 Miles of Pavement Linking the Principal Centers of Population**

Map above shows National System of Interstate Highways selected by joint action of state highway departments and approved by the Public Roads Administration.

●

A section of the Detroit Industrial Expressway—an integral part of the Interstate System. Four-lane divided highways are recommended where peak hourly traffic exceeds 800 vehicles.

# Ever-growing Traffic Demands Long-lasting CONCRETE PAVEMENT

STRENGTHENING the national defense and meeting the ever-increasing peacetime traffic needs are the objectives of the recently approved National System of Interstate Highways.

Concrete meets every requirement of the heavy traffic that this network will be called on to carry. For more than a quarter of a century thousands of miles of portland cement concrete roads and streets all over America have carried ever-increasing weights and volumes of traffic and are still good for many more years of service.

Concrete is economical, too. Not only does it usually cost less to build than any other pavement of equal load-carrying capacity, but it lasts longer and costs less to maintain. Moreover, it stretches gas and tire mileage, greatly reduces wear and tear on vehicles and cuts pavement lighting costs. It also increases visibility, thus helping reduce accidents.

Concrete is ***low-annual-cost*** pavement

For help in planning your next paving project write for a free copy of "Concrete Pavement Design." Distributed only in the United States and Canada.

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A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

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# NO JOB TOO LARGE
## for
# GALION
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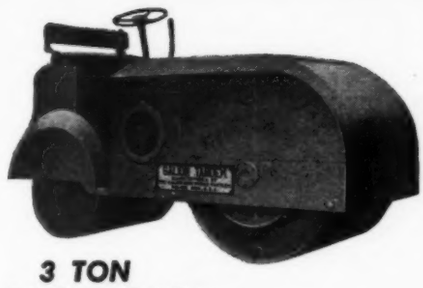

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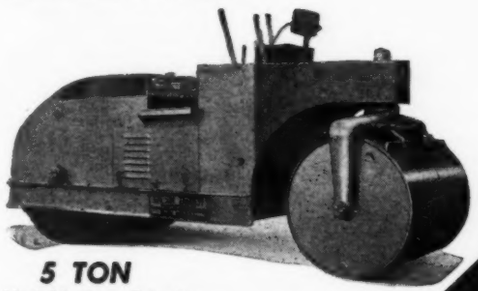
Variable from 3 to 5 tons



**5 TON**
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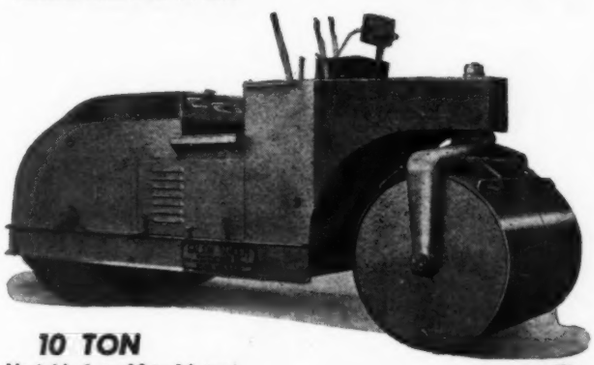
## 4 SIZES
*VARIABLE WEIGHT*

**8 TON**
Variable from 8 to 12 tons



**10 TON**
Variable from 10 to 14 tons

With GALION's complete line and Variable Weight feature you are "never too light--never too heavy" on any job of compaction. By adding or removing water ballast in the rolls of a GALION Tandem, you can get the exact weight best suited for the specific material or mix called for on any specification. Write for--

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*General and Export Offices*
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with an **Ottawa**

**HYDRAULIC FRONT-END**

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## Get Twice as Much Out of The Tractors You Now Own

Ottawa Industrial Hydraulic Front End Loaders are available for light as well as heavy model industrial tractors. Every Ottawa Loader has been designed for maximum efficiency on the tractor with which it is used. Ottawa engineers have worked closely with leading tractor manufacturers in developing loaders for specific tractors—Loaders that meet these manufacturers' specifications for capacity efficiency and sturdiness.

Ottawa Industrial Loaders and their attachments are enabling State and County Highway Departments as well as other Industrial tractor owners to cut operation costs over ½ on both light and heavy tractors.
Keep your tractors working all year 'round. Put them to work on these jobs when they would normally be idle.

1. **Load trucks with cinders, sand or salt for treatment of icy streets or highways.**
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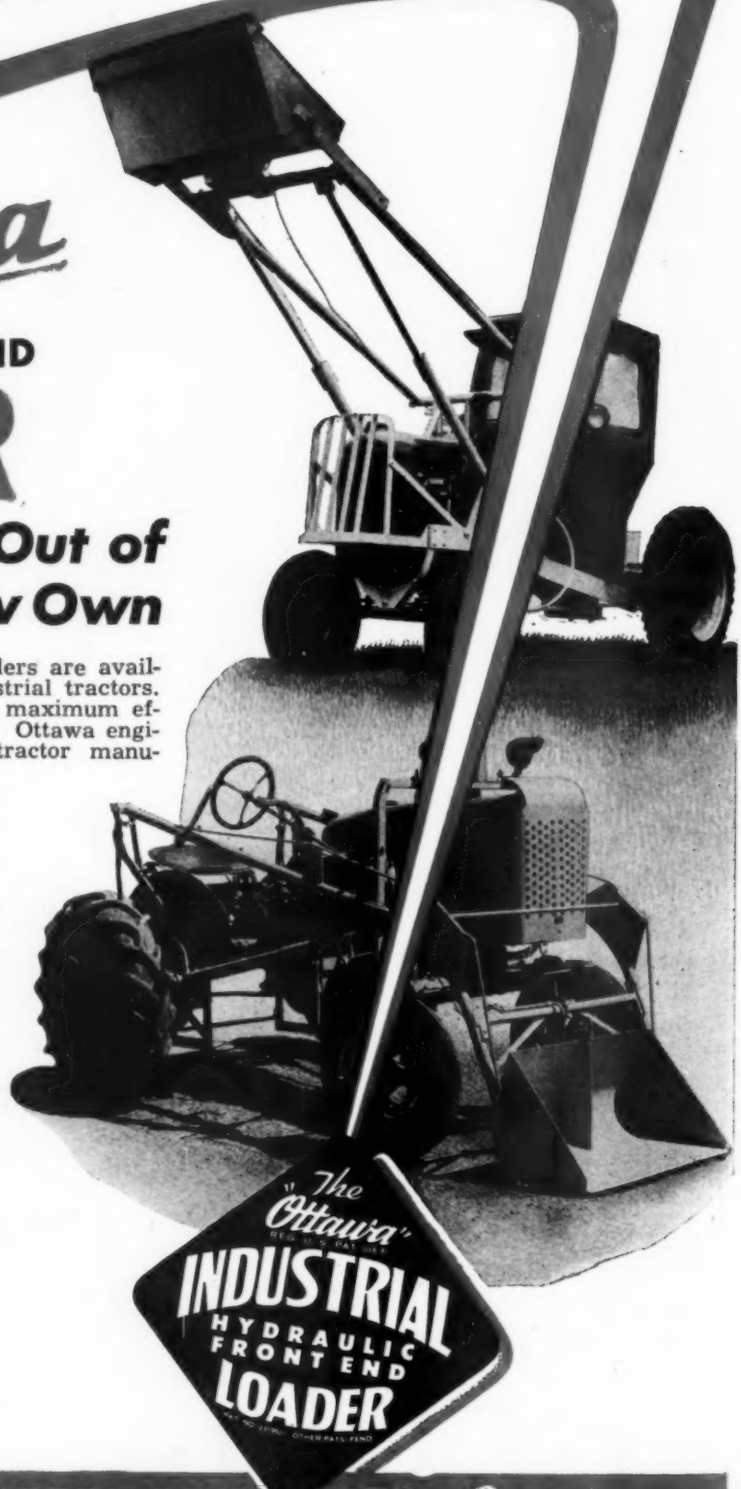
*Consult your industrial tractor dealer. If he can't supply you have him write or write direct for full information and price list.*




**Ottawa STEEL PRODUCTS, Inc.**
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

# ...AND THE CHOICE WAS 100% BLUE BRUTES!

Two Blue Brute Portable Compressors powering four Blue Brute UMW-40 Wagon Drills, breaking ground for the Franklin D. Roosevelt Veterans' Hospital near Peekskill, N. Y. Part of the All-Blue-Brute equipment used for rock excavation by the Mt. Vernon Contracting Corporation of Mt. Vernon, N. Y., sub-contracting for Merritt, Chapman & Scott of New York City and Fred J. Brotherton of Hackensack, N. J.

When a big-time contractor goes all-out for one make of equipment, it's time to sit up and take notice! That's what happened last summer, when the Mt. Vernon Contracting Corporation was awarded the sub-contract of excavating, grading and remodeling the 383-acre site of the huge, $22,400,000 Franklin D. Roosevelt Veterans' Hospital at Cruger's Park, N. Y.

For rock excavation, the Mt. Vernon Corporation selected Worthington Blue Brutes—*100%*—nine 500′ and two 315′ Blue Brute Portable Compressors, fourteen Blue Brute Wagon Drills and eighteen Blue Brute Hand-Held Rock Drills. Equipment-wise from long experience, Mt. Vernon executives knew they could count on Blue Brutes for top performance *all* day — *every* day — under the toughest going.

On your own jobs, hook up a Blue Brute Compressor with Blue Brute Air Tools and watch a hard-hitting combination start things moving—fast! You'll get new ideas about speed, efficiency and economy — and about the Blue Brute teamwork that gives you a comfortable feeling on every bid.

Your nearby Blue Brute Distributor is ready with complete details about features, capacities, performances, etc. Or write to us direct.

H8-7

**KNOW YOUR**

**BLUE BRUTES**

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

**RANSOME EQUIPMENT**

Pavers, Portable and Stationary Mixers, Truck Mixers, Pneumatic Placing and Grouting Equipment and Accessories.

**WORTHINGTON EQUIPMENT**

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**WORTHINGTON**

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

Distributors in all principal cities

**BUY BLUE BRUTES**

**IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB**

# Introducing the New

# ADAMS

## Heavy-Duty Motor Grader

## No. 610

*J. D. Adams Manufacturing Company · Indianapolis, Indiana*

Motor Graders • Leaning Wheel Graders • Elevating Graders

## Look at These Outstanding Advantages

- 100 H.P. Full-Diesel Engine—6-cylinder—powerful, dependable, economical.
- Weight to utilize *all* of the horsepower—in *all* gears.
- Push-Button Starting from the cab—standard equipment.
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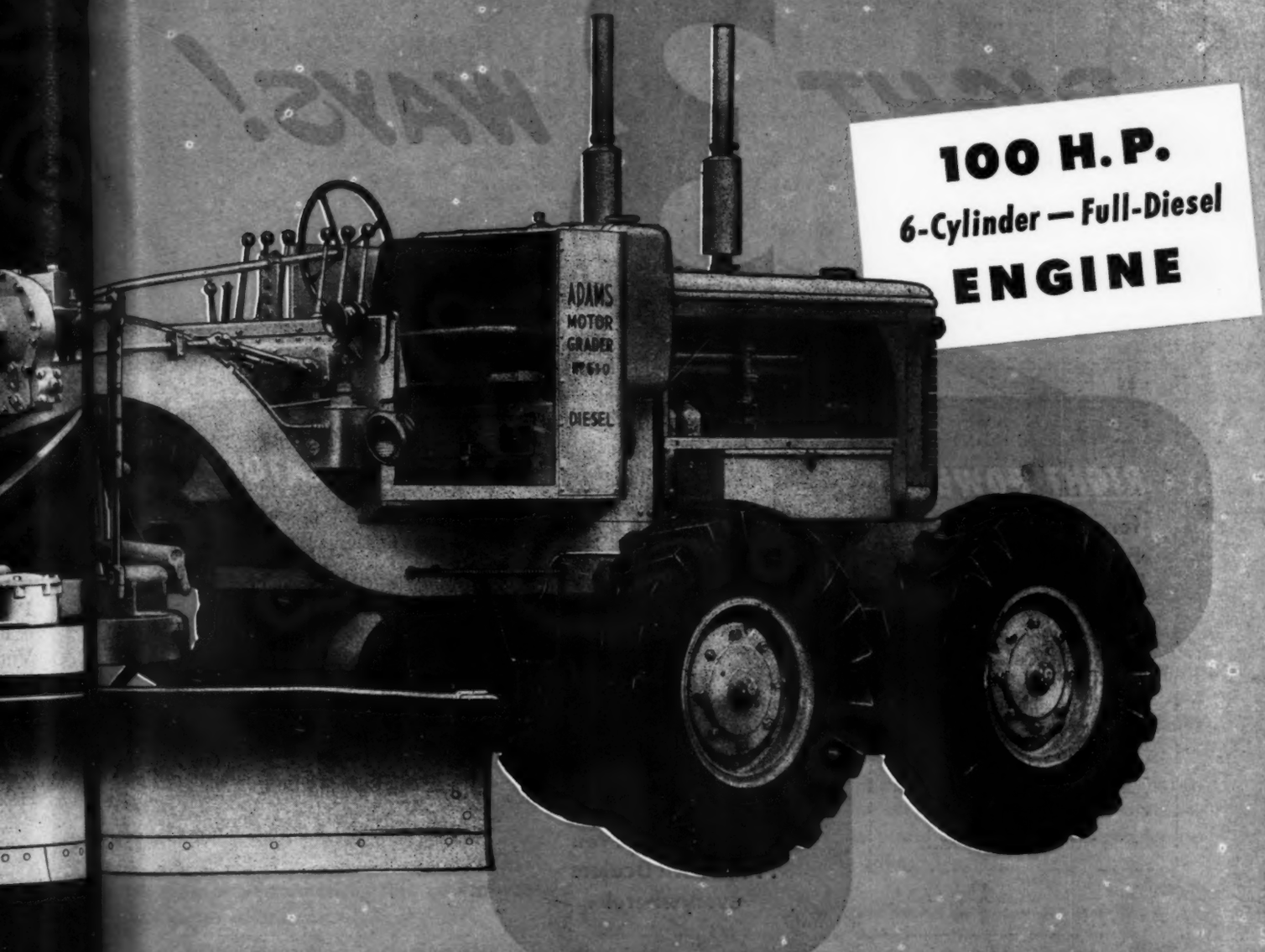
- 8 Overlapping Forward Speeds, 2 reverse speeds. High transport speed of 25 mph.
- Exceptionally Wide Blade (31 in.) to utilize the No. 610's great capacity.




**100 H.P.**
**6-Cylinder — Full-Diesel**
**ENGINE**

**ADAMS manufactures the most complete line of motor graders in the world —five models, ranging from 31 H.P. to 100 H.P. There's an Adams Motor Grader with the right power and capacity to fit your needs—exactly. For complete information, see your local Adams dealer.**

## For Industrial Power...

# FORD-BUILT ENGINES

## RIGHT 3 WAYS!

**RIGHT POWER**
for your job in the Ford Industrial Engine line!

When you apply power to any industrial job or equipment, pick FORD power . . . and know it's right three ways! Ford Industrial Engines are available as partial assemblies or completely built up, ready for the job. For new engine data sheets, send postcard.

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. . . the best of the new, right from Ford Industrial Power "Headquarters"!

**RIGHT SERVICE**
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YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED

# ROME *four O four*

## ... Unchallenged for Power

*Here* is the versatile Giant of Power . . . built to do the heavy work for better highways, airport sites and other big projects. Not only is this the biggest grader ever built, but the fastest material-moving grader. It will take more material at a single pass without stalling, than any other grader, and still have reserve power left.

A ROME 4.0.4 gets more work done with a minimum of effort. Its 104 h.p. Diesel engine is never taxed to the limit of performance. This guarantees longer life and super performance.

Every ROME operation, including steering, is accomplished by positive hydraulic pressure which responds to the operator's skill at a finger's touch on the controls in the cab, even under the heaviest conditions. Because of hydraulic controls, and since oil is slightly compressible, all shock and strain is absorbed and cushioned in oil. The simple design of the hydraulic system means trouble-free maintenance.

A ROME 4.0.4 can't be beat in work capacity, operating convenience, or job performance. Its performance records all over the world prove that costs can be cut and precious time saved.

Ask us to prove that ROME 4.0.4 is the Biggest and Most Powerful Grader ever built. Write today for catalog on ROME Grader specifications and name of nearest ROME Grader Distributor. It is an invitation to see for yourself ROME 4.0.4 advantages that pay dividends to its owners.

SMALLER ROME GRADERS

**4·0·3 and 4·0·2**

*For Selective Top Performance*

THE UNION FORK AND HOE COMPANY

**ROME GRADER AND MACHINERY DIVISION**

ROME - - - NEW YORK - - - U. S. A.

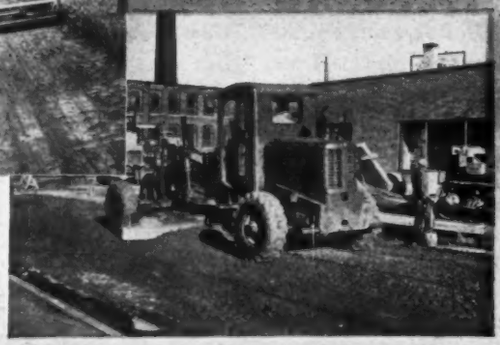
# 1948

# IN ~~1947~~ FOR THE

no other grader will perform so many highway construction and maintenance jobs so well as the. . . .

**99-H**

**FINISHING WITHOUT LEAVING TIRE MARKS . . . Blade extends 10 feet, 3 inches beyond rear wheel.**



**GRADING BETWEEN FORMS . . . All-Wheel Steer makes it easy to grade in reverse.**

BUILDERS OF ROAD MACHINERY

**Austin Western**

SINCE 1859

# 11th Consecutive Year

## The Power Grader That Has Everything!

- ✓ All-Wheel Drive
- ✓ All-Wheel Steer
- ✓ Precision Sideshift
- ✓ Controlled Traction
- ✓ High-Lift Blade
- ✓ Extreme Blade Reach
- ✓ Completely Reversible Blade
- ✓ Full Hydraulic Control

**AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.**

# you get more work out of Mack Trucks

**Built-in durability** explains the stand-out performance of Mack trucks in construction and road building work. A. Teichert & Sons, Inc., San Francisco, Calif., have been buying Macks for the past 20 years. They have found that day in, day out, a Mack on the job means more work done on the job.

# because..we put more work into Macks

**No set of Mack timing gears has ever worn out.** Mack makes them tough by case-hardening, then generator grinds the teeth for everlasting durability. Mack was the first to develop machines for generator grinding of helical gears. Mack is still the only manufacturer to use case-hardened, generator-ground timing gears.

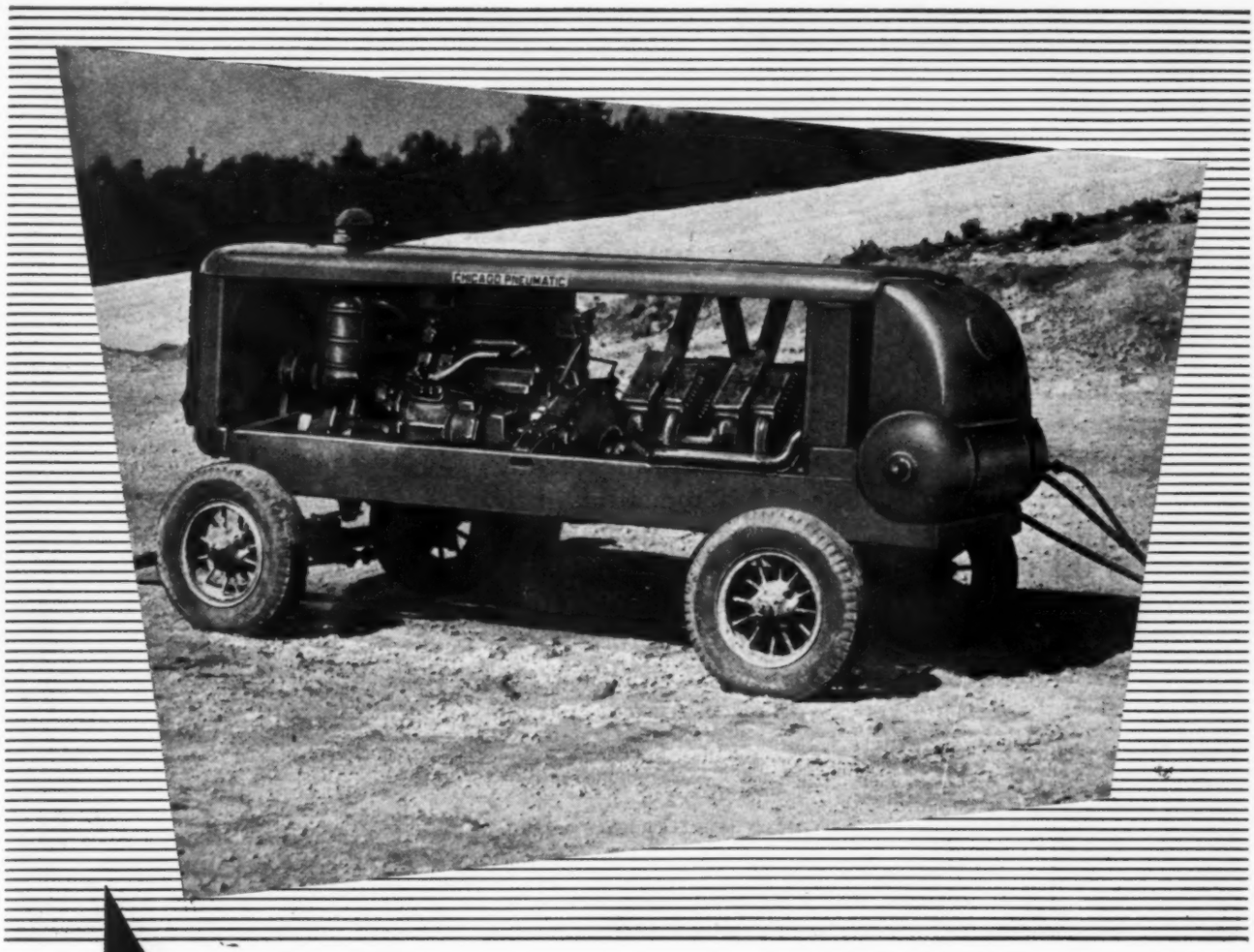
Mack

**trucks for every purpose**

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada, Ltd.

6219-1

**SINCE 1900, AMERICA'S HARDEST-WORKING TRUCK**




# Economical Operation at Any Speed

CP Portable Air Compressors are popular with the contractor because he can always count on economical operation, whether the engine is running at full or partial speed. Thanks to the CP gradual speed regulator, engine speed keeps exact pace with air demands, holding fuel consumption to a minimum. This and other CP features effect fuel savings of 15% to 35%.

On the CP-500 Diesel-driven compressor illustrated, the six-cylinder Caterpillar D-13000 engine and the V-8 arrangement of compressor cylinders are further features that promote smooth, economical performance.

CP Portable Compressors are available in gasoline-driven models of 60, 105, 160, 210 and 315 c.f.m., actual capacity, and in Diesel-driven models of 105, 160, 210, 315 and 500 c.f.m. Write for full information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

AIR COMPRESSORS • ELECTRIC TOOLS • PNEUMATIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

# WHY

**BECAUSE** ... it has a hydraulic torque converter... a simple unit which automatically balances the power of the engine against its load. Enables the tractor to put in motion any load that can be moved — (available torque for starting a load is 3½ to 4 times that required for normal travel speed with load). Tractor automatically picks up speed as load is moved — not limited to gear at which load can be started.

**BECAUSE** ... torque converter keeps tractor working at higher average speeds — takes away most of the gear shifting — automatically and constantly keeps tractor at a speed which utilizes full engine horsepower, regardless of load.

**BECAUSE** ... operation is continuously smooth. Master clutch engages under no load — no jerking, no sudden shock to tractor or operator. Full pulling or pushing power is achieved instantly with velvet-like smoothness. This means fewer repairs . . . longer life of tractor and auxiliary equipment.

Result is more work done — day in and day out — more dirt on the fill at lower cost per yard.

***THE HD-19 OUTPULLS, OUTPERFORMS ANY TRACTOR EVER BUILT!***

# ALLIS-CHALMERS

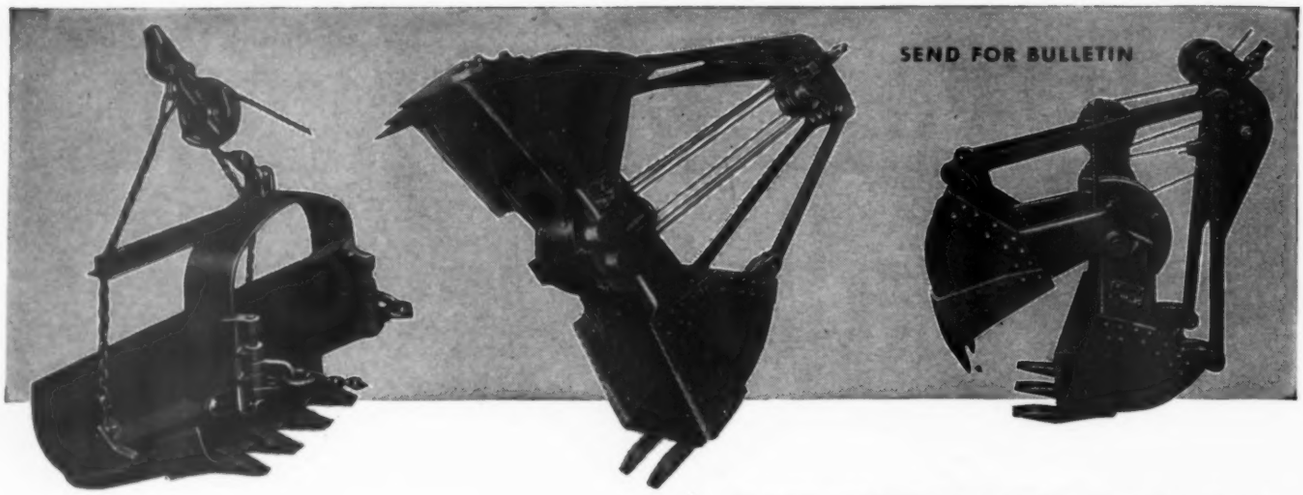
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

*Originator of the Torque Converter Tractor*

# HD-19 DOES MORE WORK *more easily, at less cost!*

ALLIS-CHALMERS HD-19, A 40,000 POUND TRACTOR with HYDRAULIC TORQUE CONVERTER DRIVE giving an infinite number of speeds in only TWO RANGES — 0 to 3 in low gear and 0 to 7 in high; reverse, 0 to 5.5.

## *IT'S RUGGED AND TOUGH BUILT TO OUTPRODUCE AND OUTLAST*




*For Longer Life!*

**WELLMAN**

*Williams Type* **BUCKETS**

• Count on longer life and more efficient service ... due to Wellman original **welded rolled steel construction.** You get the maximum digging power, and exceptional strength—without excessive weight! Specify Wellman, and you'll specify the best bucket for your purpose.

**THE WELLMAN ENGINEERING COMPANY**
**7003 CENTRAL AVENUE CLEVELAND 4, OHIO**

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**MADE TO MANEUVER FOR HEAVY HAULING**

The La Crosse Model DF12 - 16 wheels - with capacities from 40 to 67 tons - is designed to provide the same maneuverability and flexibility as the medium sized La Crosse Trailer models.

Dealers in 48 States

HEAVY DUTY **LA CROSSE** TRAILER CORPORATION LA CROSSE, WISCONSIN

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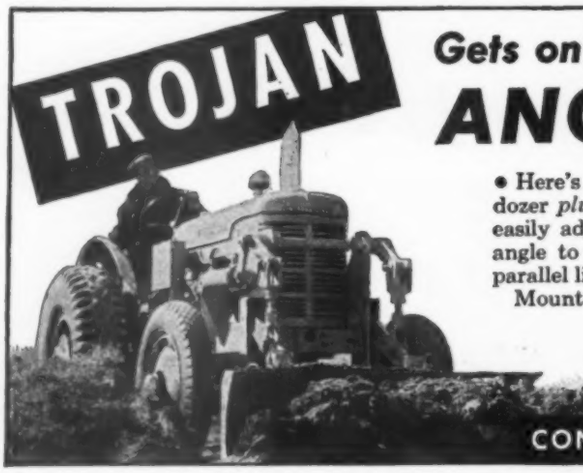
**TROJAN**



***Gets on the Job Fast . . . Cleans it up Fast***

**ANGLEDOZER**

• Here's one of the handiest pieces of equipment you ever saw. It is a bulldozer *plus*. Besides the regular bulldozing position, it can be quickly and easily adjusted for six other angles. You always have exactly the right angle to do a particular job faster and better. And, Trojan's patented parallel lift mechanism always holds the blade steady—*no flopping around.*

Mount a Trojan Angledozer on your Industrial Wheels. Make them do double duty. Easy to mount . . . easy to operate . . . low in costs. Let your International dealer give you all the angles on the ANGLEDOZER, or write to Department RS-82.

CONTRACTORS MACHINERY CO., INC., BATAVIA, N.Y.

# Firestone
## EARTH MOVER TIRES

FIRESTONE builds off-the-highway tires for every road, load and condition of service. For big, free-rolling scrapers, tractor and trailer wagons and buggies, that tire is the Firestone Earth Mover.

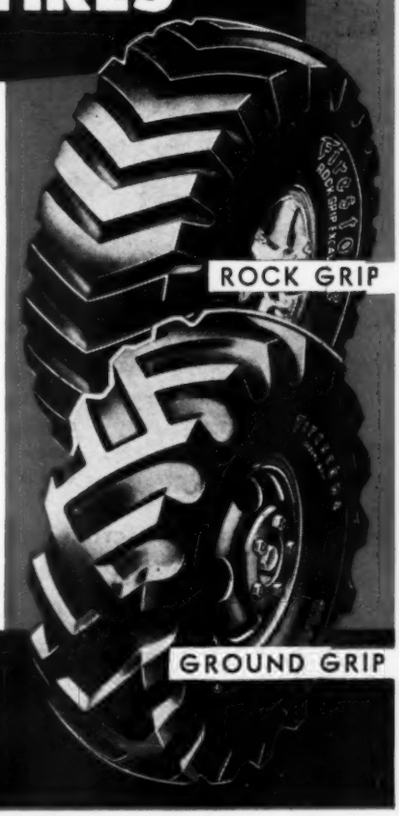
It provides maximum flotation and minimum rolling resistance. Its extra strength rayon cord body and its extra tough cut-resistant tread are built to stand up on the job . . . to stay on the job. This means more yardage, less downtime . . . more profit.

If you want the greatest possible traction for the drive wheels of your earth moving units, use the Firestone Ground Grip Tire. For stamina and extra traction in quarrying, logging, strip mining . . . use the Rock Grip.

Proven cost-cutters on every job.

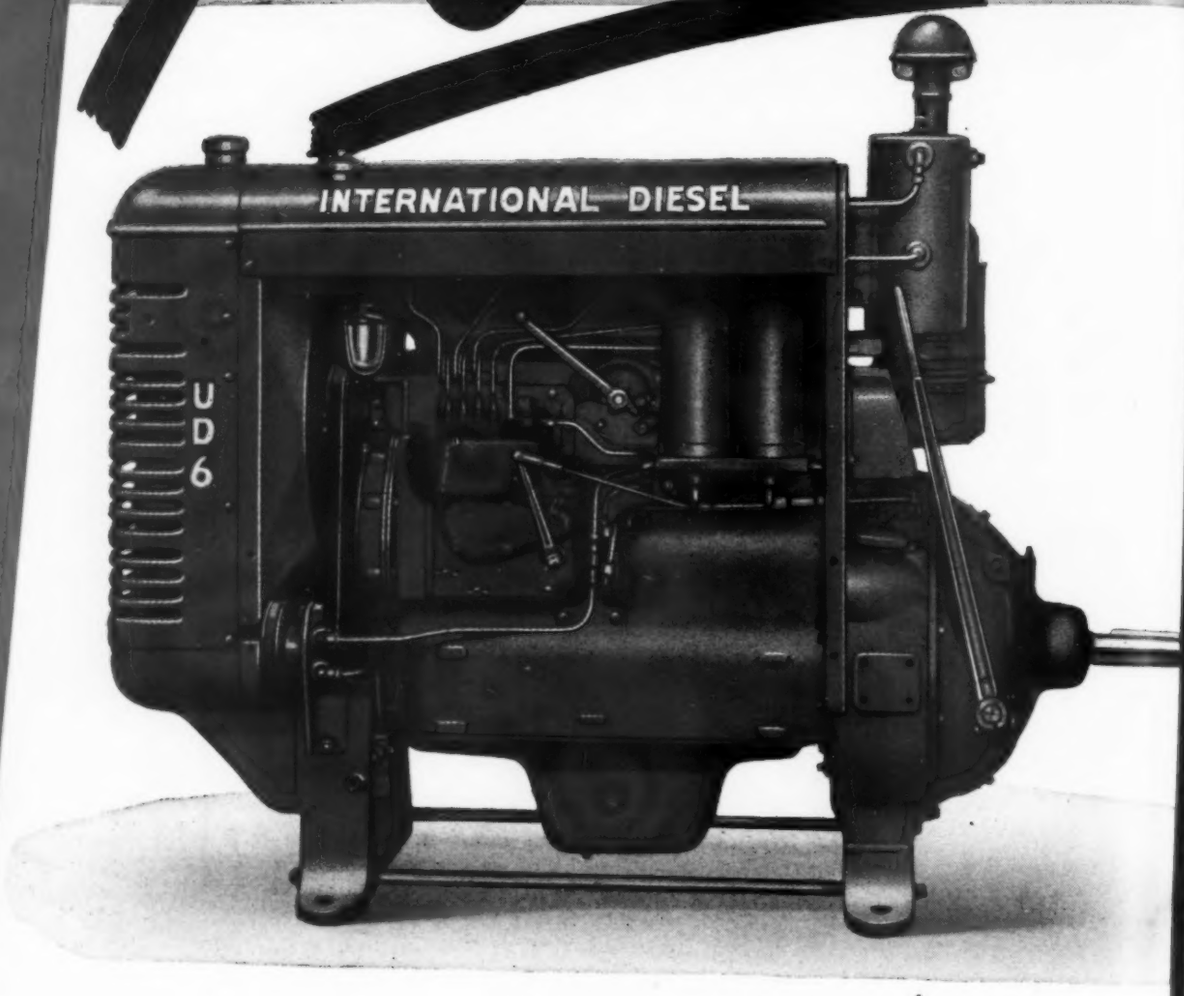
*Listen to the Voice of Firestone every Monday evening over NBC*

Copyright, 1948, The Firestone Tire & Rubber Co.




Firestone OFF-THE-HIGHWAY TIRES

# Power



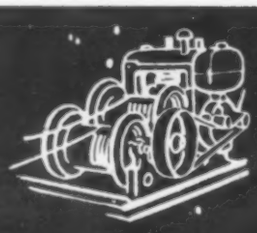

## 39 *working* Horsepower

That's what the International UD-6 Diesel Power Unit, above, delivers at 1500 r.p.m. It has all the features which give Internationals superiority on any powering job! No other make of Diesel has them all. A self-contained starting system permits hand cranking or use of an optional 12-volt electric starter for easy starting regardless of weather.

The UD-6 is a smoothly operating, 4-cycle, valve-in-head engine with advanced design fuel injection; thermostatically controlled cooling; full-pressure lubrication; long-wearing, replaceable, file-hard cylinder liners; induction-hardened crankshaft; heavy-duty precision bearings; sensitive, variable-speed governor with torque control; renewable-element oil filters and a large capacity oil-bath air cleaner. Put it to work and it will give you faithful service for many years.

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

# INTERNATIONAL



HOISTS

ROCK CRUSHERS

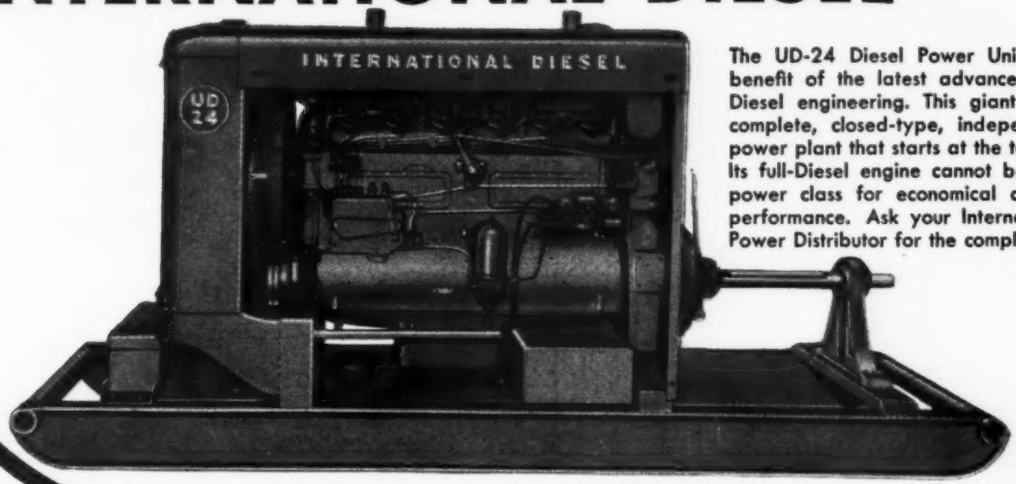
# TO YOUR ORDER

INTERNATIONAL Engines and power units are available in a range of sizes that makes delivery of *POWER to Your Order* a simple matter! Simply choose from the International line of *four* carburetor-type and *six* Diesel power units. That's the way to be sure of getting the full rated horsepower, the matchless operating economy, the dependability and long service life which Internationals deliver. The horsepower range is from 22 to 55 H.P. for carburetor models and 39 to 180 H.P. for the Diesels.

Let your International Industrial Distributor help you select the power and equipment you need. He can show you why it's *good business* to standardize on Internationals.

*Industrial Power Division* **INTERNATIONAL HARVESTER COMPANY** 180 N. Michigan Ave., Chicago 1, Ill.

## The NEW 180-Horsepower INTERNATIONAL DIESEL



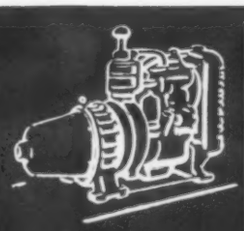

The UD-24 Diesel Power Unit gives you the benefit of the latest advance in International Diesel engineering. This giant of power is a complete, closed-type, independent, portable power plant that starts at the touch of a button. Its full-Diesel engine cannot be matched in its power class for economical and dependable performance. Ask your International Industrial Power Distributor for the complete story.

**Delivers 180 H.P. at 1375 r.p.m.**

INTERNATIONAL HARVESTER

# *Industrial Power*

PUMPS



GENERATORS

IMPROVED OWENS

A MOUTHFUL AT EVERY BITE

## DIG for IMPROVEMENTS ...EVERYWHERE

Long experience and intensified experimentation has enabled Owen engineers to originate designs, utilize special alloys and develop methods of manufacture that reduce weight, increase strength and provide greater wear resisting qualities.

*"Owen Clamshell Buckets Insure a Bigger Day's Work."*

**The Owen Bucket Company**
6070 Breakwater Avenue, Cleveland, Ohio
Branches: New York • Philadelphia • Chicago • Berkeley, Cal.

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# ETNYRE
"Black-Topper"
BITUMINOUS DISTRIBUTORS

**ACCURATE...DEPENDABLE...ECONOMICAL**

On new road construction or making those much needed road repairs you can do the job faster, better and cheaper with an Etnyre "Black-Topper"... designed to save you time, labor and material. See your Etnyre dealer or write direct.

**E. D. ETNYRE & CO., Oregon, Illinois**

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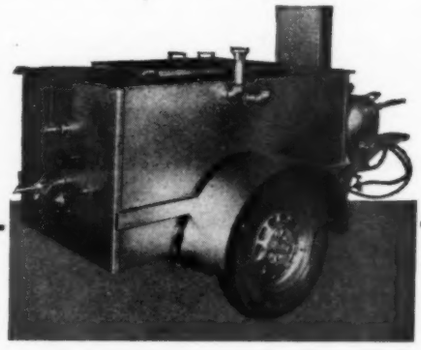

## White Oil Jacketed Kettles for Heating Elastic Joint Filler

Joint filling compounds containing rubber, for elasticity, must have indirect heat application. They melt at 375° and must not exceed 425°. White Model F-10 kettles maintain this temperature accurately by an oil jacket which transfers heat to the compound.

White kerosene burners are safe and dependable, easily controlled. Hand operated agitator. Insulated housing.

Other models for pavement maintenance have FIRE-PROOF tops. Hand or engine sprayers. Made in several sizes.

**Write for Catalog.**

**Elkhart White Mfg. Co. Indiana**

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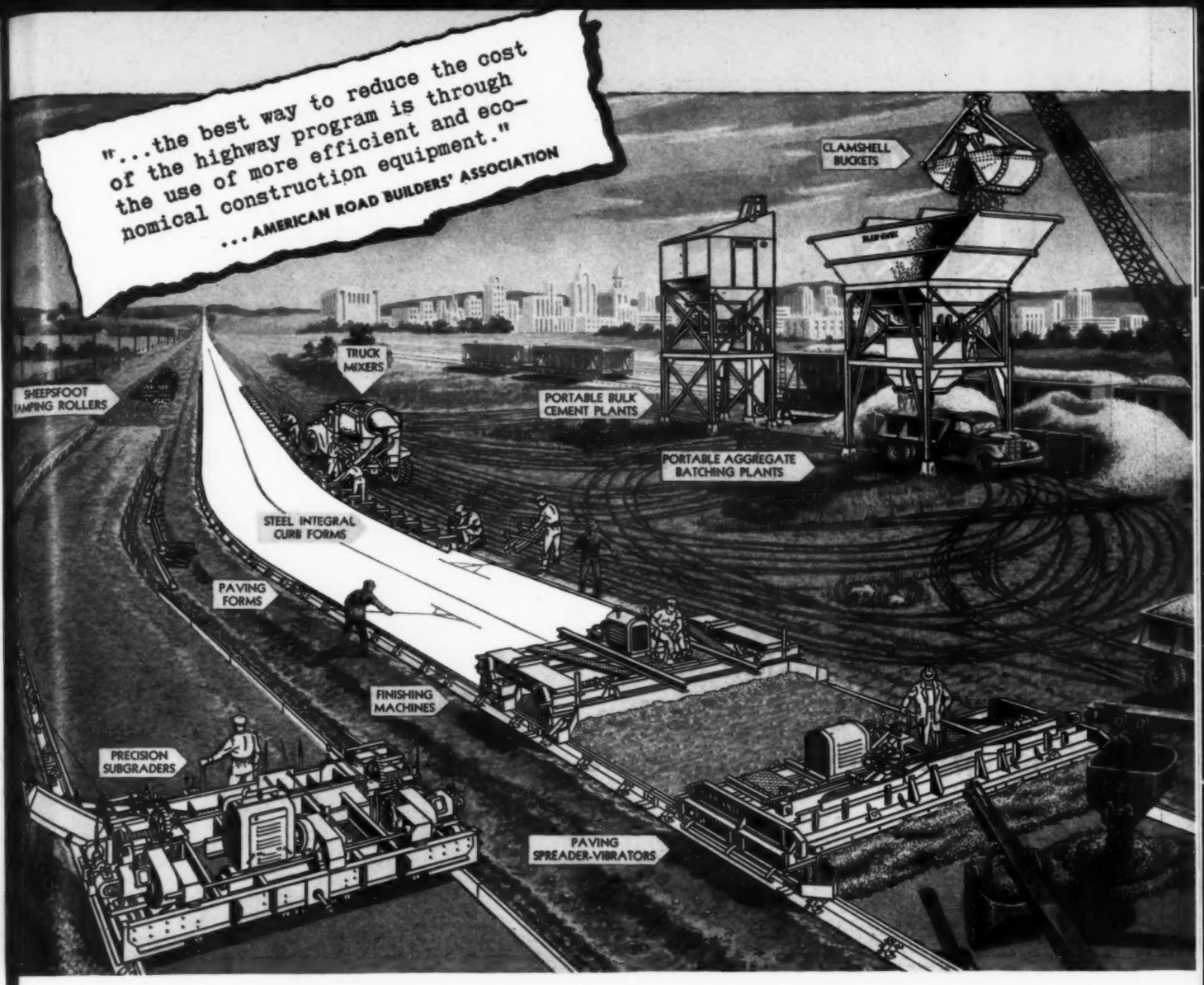
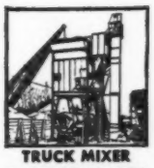
## save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

**C. R. JAHN COMPANY**
Dept. 1345—1106 W. 35th Street, Chicago 9, Illinois
***Heavy duty trailers from 5 to 100 tons***

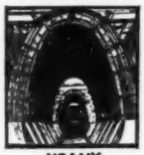

"...the best way to reduce the cost of the highway program is through the use of more efficient and economical construction equipment."
...AMERICAN ROAD BUILDERS' ASSOCIATION
CLAMSHELL BUCKETS
TRUCK MIXERS
SHEEPSFOOT TAMPING ROLLERS
PORTABLE BULK CEMENT PLANTS
PORTABLE AGGREGATE BATCHING PLANTS
STEEL INTEGRAL CURB FORMS
PAVING FORMS
FINISHING MACHINES
PRECISION SUBGRADERS
PAVING SPREADER-VIBRATORS

# Contractors who have mechanized with BLAW-KNOX Construction Equipment agree with A.R.B.A.


TRUCK MIXER LOADING PLANTS

STEEL STREET FORMS

CONCRETE BUCKETS


HEAVY STEEL FORMS

Blaw-Knox has brought America's famous "mass production" methods to the construction of highways, airports, roads and streets. The tried and true machines and equipment illustrated make possible *better concrete paving, with the fewest men, at lowest cost, in the quickest time*... If performance like that interests you why not see the nearest Blaw-Knox distributor or write direct for complete data on the latest developments in Mechanized Paving.

**BLAW-KNOX DIVISION of Blaw-Knox Company**
**2003 FARMERS BANK BUILDING, PITTSBURGH 22, PA.**
**NEW YORK • CHICAGO • PHILADELPHIA • BIRMINGHAM • WASHINGTON**
***Representatives in Principal Cities***

# BLAW-KNOX

## Time and Labor Saving CONSTRUCTION EQUIPMENT

KOEHRING HEAVY DUTY

# twinbatch*

## FOR MOST ECONOMICAL PACE

- **Can hit top output of 90 batches per hour on many jobs.**
- **Job-tested design . . . Heavy-Duty construction keep paving on schedule**

### Check these economy-production features on the 34-E *twinbatch*

- **Big, 10′-wide skip** for truck loading is fast-charging . . . hoists in only 8 seconds . . . large throat discharges almost complete load before skip is in elevated position.
- **Mix from 50 to 90 batches** per hour depending on specifications and job conditions. Positive air control by Batchmeter actuates transfer and discharge chutes . . . saves more seconds . . . is easy on the operator.
- **30° elevating boom** (optional) lets you pour wall foundations, footings, abutments for handy profits in addition to paving.
- **Low 12′-2″ clearance** lets you pave under low bridges and overpasses as easily as in the clear . . . ship without dismantling.
- **Double-door boom bucket** dumps full batch instantly . . . travels by power as boom swings . . . can be dumped at any point along boom, for high-speed concrete distribution on the grade without loss of time.
- **Accessibility** of every maintenance point, plus heavy-duty construction, protects your profits against costly down-time . . . keeps the 34-E *twinbatch* producing at peak efficiency.

* *twinbatch* — DUMPTOR — Trademark Reg. U. S. Pat. Off. K804.

# KOEHRING COMPANY

MILWAUKEE 10, WISCONSIN

*Subsidiaries:* JOHNSON · PARSONS · KWIK-MIX

# PAVER
## ON EVERY JOB

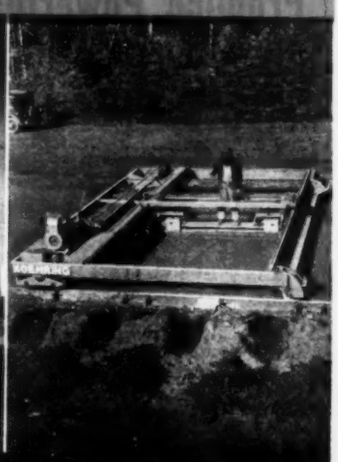
Ask your Koehring distributor to show you how this high-speed, heavy-duty 34-E *twinbatch* paver saves seconds every batch on your paving. Its proven job performance on scores of today's paving projects is your assurance of on-schedule production and lowest-cost operation.

**From initial grade to final finishing...KOEHRING products protect your profits**

**½-YD., ¾-YD., 1½-YD. SHOVELS**
for big-production, low-cost excavation.

**HEAVY-DUTY, 6-YD. DUMPTORS**
for off-road, shuttle hauls... dump in 1 second.

**CRANES ON RUBBER TIRES**
for more speed and mobility on heavy-lifting jobs.

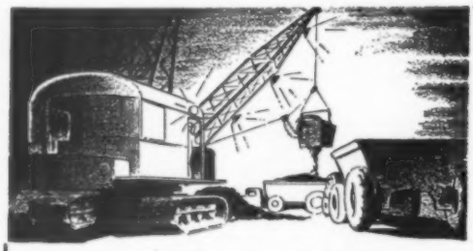


**LONGITUDINAL FINISHER**
for accurate surfaces finished fast; at low cost.

# For All Small Asphalt Mixing Jobs

Here's a portable asphalt mixer that will handle all types of small asphalt mixing jobs. The Foote Kinetic Mixer is ideal for handling asphaltic mixes for driveways, sidewalks, tennis courts, floors and parking areas. It can be taken anywhere, towed behind a car or truck. Will handle hot or cold mixes...3 cu. ft. in 30 seconds. This mixer gives a high volume output for a small investment. It employs a new mixing principle that assures a thorough coating of aggregate. For details, write for Bulletin K-100.

**THE FOOTE COMPANY, INC.**
1936 State Street, Nunda, New York

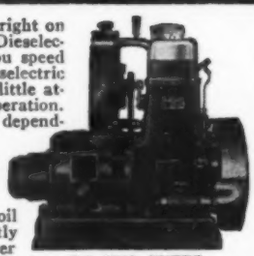


WITTE
EST. 1870

## Produce Powerful Electric LIGHT on Cheap Diesel Tractor Fuel Oil!

## WITTE DIESELECTRIC PLANTS

Ample electric light and power produced right on the job by your sturdy, compact WITTE Dieselectric Plant cuts manpower costs—helps you speed work schedules. Full Diesels, WITTE Dieselectric Plants are built for heavy duty—require little attention over long periods of continuous operation. Start and operate with famed WITTE dependability regardless of climatic conditions.


7.5 KVA WITTE Dieselectric Plant

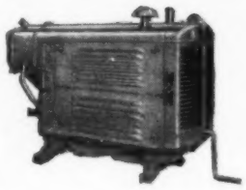
***Make Your Operations "All-Diesel" and Use but a Single Fuel***

Requiring only cheap, non-explosive fuel oil WITTE Dieselectric Plants keep risky, costly gasoline off your jobs. Save up to 75% over gasoline powering costs. Power your compressors, pumps, electric hand-tools, hoists . . . have ample lighting . . . at *low* cost. There's a WITTE from 3 to 10 KVA-AC; 2.5 to 8 KW-DC to fit your needs. Write for literature or see your WITTE DEALER, *now*.

**WITTE ENGINE WORKS**
DIVISION OF OIL WELL SUPPLY COMPANY — UNITED STATES STEEL CORPORATION SUBSIDIARY
AMERICA'S PIONEER BUILDER OF SMALL DIESELS — KANSAS CITY 3, MO., U.S.A.

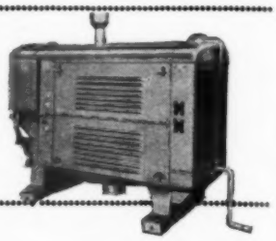
## *Look to* MM *for* POWER, ECONOMY, AND EFFICIENCY

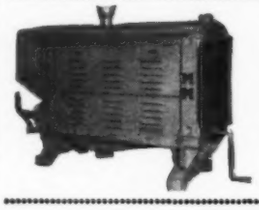
IN STATIONARY POWER AS WELL AS INDUSTRIAL TRACTORS



Model 165-4A 3⅜" x 4"—4 Cylinder 26 H.P. at 1500 RPM Burning Gasoline. 165 cu. in. displacement. Wt.: 1060 lbs. Model 206A-4A 3⅜" x 5"—4 Cyl. 38 H.P. at 1500 RPM Burning Gasoline. 206 cu. in. displacement. Wt.: 1080 lbs.

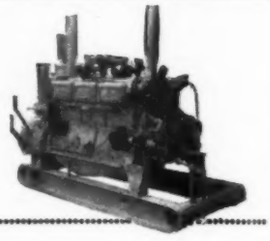
Model 283-4A 4¼" x 5"—4 Cylinder 52 H.P. at 1400 RPM Burning Gasoline. 283 cu. in. displacement. Wt.: 1850 lbs. Model 403-4A 4⅜" x 6"—4 Cylinder 64 H.P. at 1200 RPM Burning Gasoline. 403 cu. in. displacement. Wt.: 1950 lbs.

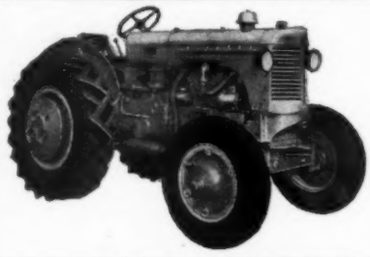




Model HUA 4⅝" x 6"—6 Cylinder 94 H.P. at 1200 RPM Burning Gasoline. 605 cu. in. displacement. Wt.: 3000 lbs.

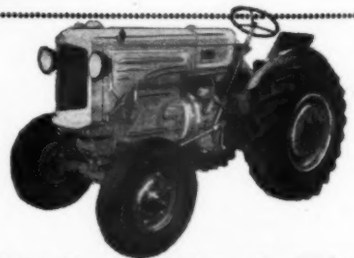
Model 1210-12A 4⅝" x 6"—12 Cylinder 206 H.P. at 1400 RPM Burning Butane Gas. 1210 cu. in. displacement.





Model UTI Industrial Tractor 49 H.P. 126" Overall Length. 76" Overall Width. 16' Turning Radius.

Model RTI Industrial Tractor 27 H.P. 104" Overall Length. 59" Overall Width. 12' Turning Radius.

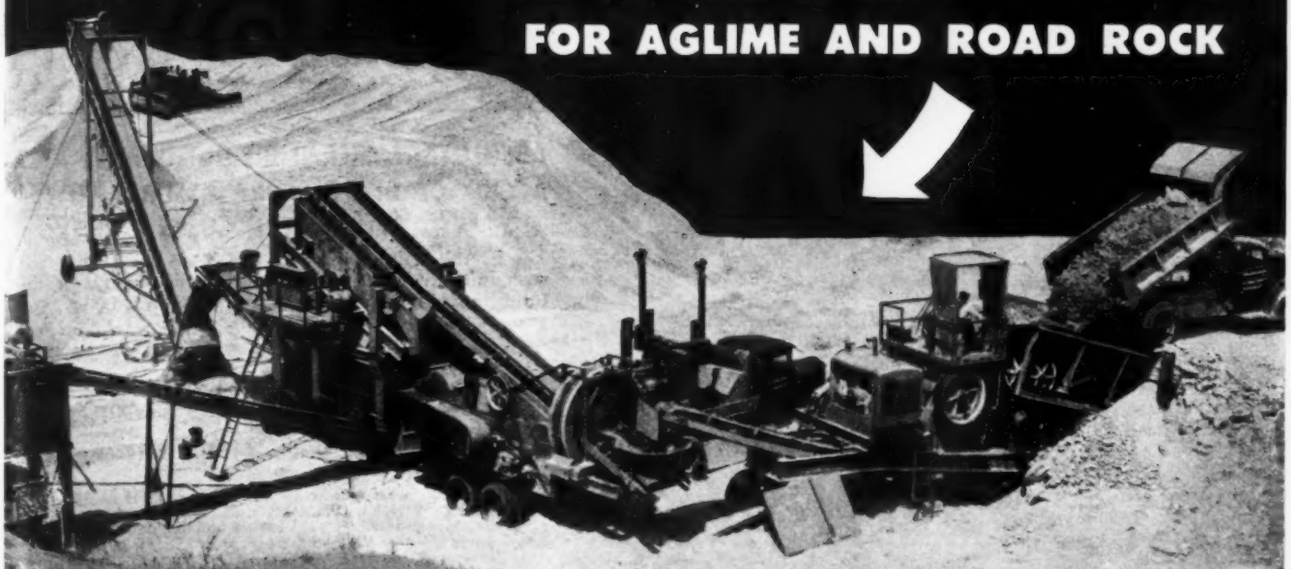


*See Your Nearest MM Dealer—Distributor Or Write*

**MINNEAPOLIS-MOLINE**
**POWER IMPLEMENT COMPANY**
MINNEAPOLIS 1, MINNESOTA

# A RIGHT COMBINATION

## FOR AGLIME AND ROAD ROCK



## UNIVERSAL { 546-P Primary / 1800 Secondary

The 546-P Primary is fed direct from quarry by power shovel, or trucks dumping from ramp set-up. It consists of a jaw crusher, shovel-loading hopper with built-in apron feeder, bar-grizzly and by-pass, operator's platform and ladder, under conveyor and power—all mounted on a gooseneck truck with pneumatic tires, brakes, and rear wheel equalizers.

The 1800 Series Secondary receives the output of the 546-P, screens out the finished aglime and road rock. and delivers the oversize to a Universal hammermill. The output of this mill is returned to the main conveyor by means of an underconveyor and Rotovator wheel. Finished products are delivered to trucks or stock piles by belt conveyors. By adjusting the hammers and changing the grates in the hammermill you can regulate the size of the finished product to aglime or road rock or both. The 1800 Series Secondary is available in 3 sizes with capacities up to 150 tons per hour of aglime and road rock.

*Universal builds a variety of "Right Combinations" for aglime and road rock production. Let Universal show you how to get volume production at a cost that leaves more profit. Write for Bulletin No. 551.*

**For flexibility, portability, and profit-making capacity you can't beat this two-unit Universal "Stream-Flo" combination. It's a complete crushing, screening, and loading plant for volume production of either aglime or road rock.**

*FOR **MORE** TONS PER HOUR*
*AT **LESS** COST PER TON*
*IT'S **UNIVERSAL***

**UNIVERSAL ENGINEERING CORPORATION**

631 C AVENUE N. W. CEDAR RAPIDS, IOWA

ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL, AND LIME PLANTS, SCREENING AND WASHING PLANTS—CONVEYORS—APRON FEEDERS

# FOR PRIMARY BLACK TOP

## UNIFORM PRESSURE AND TEMPERATURE ALONG ENTIRE 24 FOOT BAR

To prove the superior performance of Standard Steel Model 424 we placed pressure gauges at various points along the spray bar and at the same points on competitive equipment. At 40° Fahrenheit, outside temperature, convincing proof was obtained that our equipment maintained 28 pounds even pressure at every inch of the spray bar.

## ABSOLUTE TEMPERATURE UNIFORMITY AND ACCURACY OF PRESSURE ASSURES LOWER PRODUCTION COSTS

The STANDARD STEEL WORKS Pressure Distributor with full circulating spray bar gives the contractor the following advantages over competitive machines:

1—*No unnecessary and costly delays* due to frozen spray bar sections — complete circulation is assured from end to end of bar.

2—*Accurate application at low cost per gallon means higher profit* — no delays — no test runs — no warm-up periods.

3—*Satisfied operator* eliminates high labor cost due to big labor turn-over.

Scientific test with precision instruments proved that the STANDARD STEEL WORKS full circulating spray bar gives absolute uniformity of pressure and temperature the full length of spray bar. This scientific spray bar test was made at 40° Fahrenheit, outside temperature. Pressure gauges were placed along the entire 24' length, full circulating spray bar. Pencil-type thermometers were located at each end of the bar. The STANDARD STEEL WORKS full circulating spray bar, on discharge, produced 28 pounds *even pressure* at each gauge, across the entire 24' length of bar. The temperature gauges indicated 350° Fahrenheit. The temperature dropped between the tank and the spray bar, exactly 4°. The competitive spray bar which came the closest to this high standard is indicated on the charts below as "Best Competitive Make."

## "BEATS THE BEST"—SEE CHART BELOW

Tests charted below indicate exact pressure at each pressure gauge along entire 24' length of spray bar. 85-100 penetration asphalt was used in this test. Note pressure and temperature variation of competitive equipment. Note steady pressure and temperature control in Model 424.

**85-100 PENETRATION *(Heavy Oil)***
**STANDARD STEEL DISTRIBUTOR**

| OPERATION | GAUGES 1 | 2 | 3 | 4 | 5 | 6 | ENG. R.P.M. | TEMPERATURE LEFT END | RIGHT END |
|---|---|---|---|---|---|---|---|---|---|
| SPRAY | 28 | 28 | 28 | 28 | 28 | 28 | 300 | 350°f | 350°f |
| **"BEST COMPETITIVE MAKE"** | | | | | | | | | |
| SPRAY | 37 | 35 | 42 | 41 | 43 | 43 | 300 | 290°f | 280°f |

# FOR SECONDARY CONSTRUCTION AND MAINTENANCE

## A $1500 "SJ" WILL MAKE SMALL BLACK TOP JOBS PROFITABLE

The efficient, low-cost Model SJ Distributor opens up new fields of profitable black top work for contractors — County and Township roads, City streets, Alleys, Sidewalks, Parking Lots, Playgrounds, Driveways, and Small Airports.

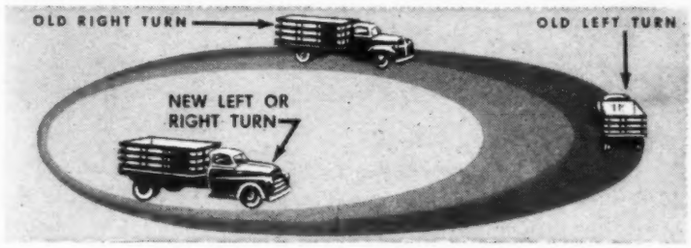
The 600-Gallon Model SJ pictured here has a 100 G.P.M. Pump powered by an 8 h.p. engine. It handles any type of material through spray bar lengths, up to 10 feet. The two powerful burners pouring heat through 5" flues, assures fast heating. Dual lever controls all pumping operations — spraying shoulders, relocating curves, hand spray, seal coating, patching chuck holes, or crack filling from curb side gravity draw-off.

**OTHER STANDARD PRODUCTS**
Pressure Distributors
Street Flushers
Maintenance Distributors
Tar Kettles
Burner and Tank Outfits
Paving Tools
Asphalt Pumping Unit

*Built to the Highest*
**Standard**

**Standard Steel Works**
NORTH KANSAS CITY, MO., U.S.A.

# ONLY DODGE OFFERS YOU ALL THESE NEW Truck Features

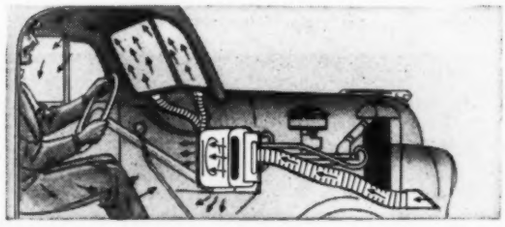



## 1. NEW ALL-WEATHER VENTILATION

Year-'round *comfort* is assured by a combination of fresh air intake, hot water *truck* heater, defroster tubes, vent windows, and cowl ventilator.

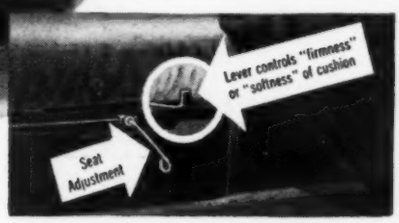
## 2. EASIER HANDLING BECAUSE OF NEW CHASSIS DESIGN

You can turn these new "*Job-Rated*" trucks in much smaller circles—and steering is much *easier*, too. This is due to a new type of steering, in combination with shorter wheelbases. Front axles have been moved back and engines forward, placing more of the engine and cab weight on the front axle. You get much better weight distribution.



## 3. MORE COMFORT FROM "AIR-O-RIDE" SEATS

New weight distribution, wider tread front axle, longer springs produce a marvelous new "cushioned ride." "Air-O-Ride" seats give a "soft," "firm," or "medium" seat. 7 full inches of seat adjustment.




## 4. IN ALL . . . 248 BASIC "*JOB-RATED*" MODELS

Every unit of every Dodge truck, from engine to rear axle, is "*Job-Rated*" for economy, performance, and long life. You save money with a truck that fits *your* job! 248 *different* basic chassis and body models, engineered for gross vehicle weights up to 23,000 pounds, and gross train weights up to 40,000 pounds.

**NEW DODGE "Job-Rated" TRUCKS**

...and only Dodge builds "Job-Rated" trucks!

# TOURNADOZERS

## Mississippi

Tournadozer operator Barney Sullivan, of District 6, reports . . . "It sure is easy to handle . . . not many controls to contend with, only one pedal. I sure like its speed and those brakes . . . can stop it anywhere I get ready. There's mighty little maintenance on this Dozer. I can look over the blade and see what I'm doing. It's comfortable riding. In fact, I haven't found a thing I don't like about this Tournadozer."

## TOURNADOZER PROVES ITSELF A GOOD "MUDDER"

### On Tough Levee Job in Mississippi District 3 . . . . .

For the past two months, a second Tournadozer working for District 3, Mississippi State Highway Department, has been working steadily on ¾ miles of levee to protect Highway 7, between Greenwood and Grenada. It's a tough assignment. Material is mostly clay and gumbo . . . always wet and slick, so soft in some spots that the Tournadozer sinks in to its undercarriage. However, it climbs out under its own "steam" . . . and goes right on working. In fact, the Tournadozer's 4-wheel drive on big, low-pressure rubber tires, plus instantaneous, non-stop speed selection have enabled it to help bogged-down crawler rigs out of the muck. Operator James F. Ross says . . . "It's got more power . . . easy to operate . . . doesn't tire you out."

LETOURNEAU
PEORIA, ILLINOIS

HIGH-SPEED RUBBER-TIRED

TOURNADOZERS

# S *prove ability* to lick pi muck...wet clay...sand

## Fast job-to-job mobility saves time in Mississippi State Highway District 6

Mississippi State Highway Department, at Hattiesburg, keeps this big rubber-tired Tournadozer busy shuttling from one job to the next. When the rig was needed in a hurry at an asphalt plant, 10½ miles away, no time or man-hours were wasted waiting for a trailer. Tournadozer operator hopped on . . . traveled over city streets and down highway to the plant at speeds to 15 m.p.h. . . . was hard at work in less time than it normally takes to locate a trailer and get ready to load an ordinary track-type dozer.

### Rubber Tires Prove Efficient in Loose, Abrasive Sand

At the asphalt plant, the 180 h.p. Model C Tournadozer fed big loads of sand fast, because 21.00 x 25 low-pressure tires and powerful, 4-wheel drive provide ample flotation and traction in the loose material. Too, with Dozer on rubber, there are no parts to grind and wear in abrasive sand. Fast back-up speeds (same as 4 forward speeds) and constant-mesh, "no-shift" transmission save time every dozing cycle.

### Fast Back-Ups Gained 2 Work Hours per Day

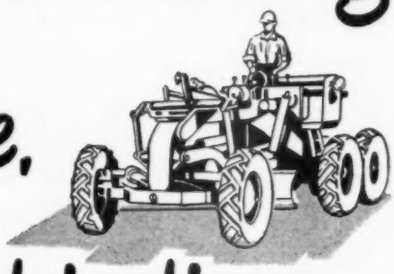
On a previous job, building a football field at Mississippi Southern College, Hattiesburg, District 6 used its Tournadozer to clear 18" pine trees and grade the field. On leveling the wet clay and chalk, the operator reported that Tournadozer's high reverse speeds saved turning . . . gained about 2 hours work-time every 9-hour day.

Fast job-to-job moves and faster dozing cycles are just two of the ways these big rubber-tired Tournadozers have saved time and money for Mississippi State Highway Department on their dozer work. Ask your local LeTourneau Distributor for a complete picture of the savings possible on *your* work with Tournadozers. See him TODAY.

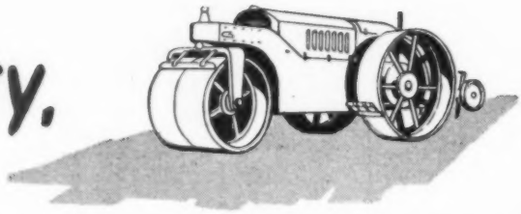
Tournadozer—Trademark C87

LETOURNEAU LeT EQUIPMENT

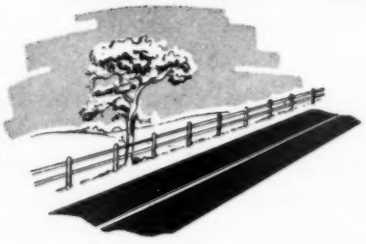
# Now Available!....Improved STANDARD ROAD OILS – with these advantages: better wetting or coating of aggregate,



greater stickiness and binding quality,



faster setting, blacker appearance.



You'll get longer-lasting, all-weather surfaces for secondary roads

with.....

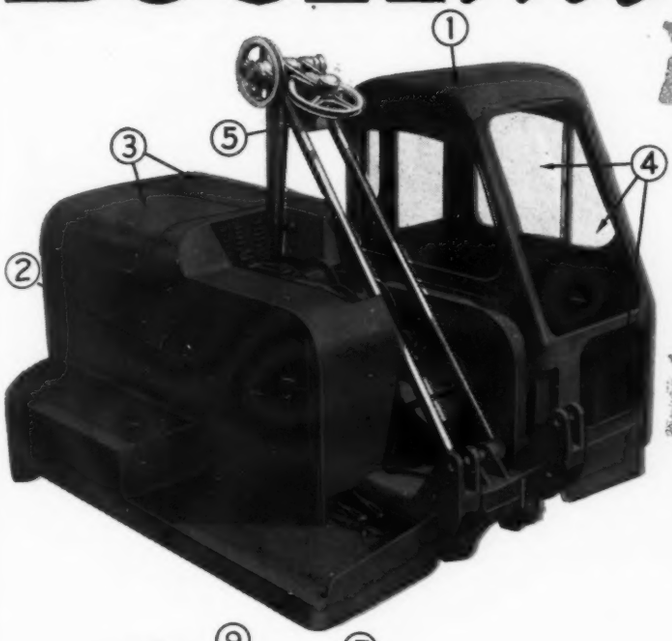
**STANDARD OIL ROAD OILS**

Ask a Standard Oil Asphalt Representative for all the facts about this improved road oil. Write Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

**STANDARD OIL COMPANY (INDIANA)**

STANDARD

# Look *into* UNIT!




## FULL VISION CAB

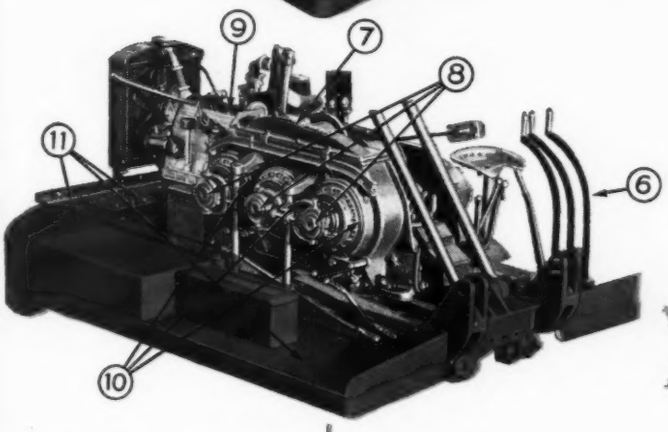
**1.** Streamlined to the minute in design . . . operator can see in ALL directions . . . clear visibility around a complete 360° circle, without sacrificing weight, capacity, or headroom.

**2.** Sliding side panels provide accessibility to motor and clutches.

**3.** Easily lifted top hood covers . . . locked from within the cab.

**4.** Shatter-proof Safety Glass used throughout the entire cab.

**5.** A Frame front legs and end connections are one-piece drop forgings.




## MAIN MACHINERY

**6.** Curved operating levers . . . for easy operation and control.

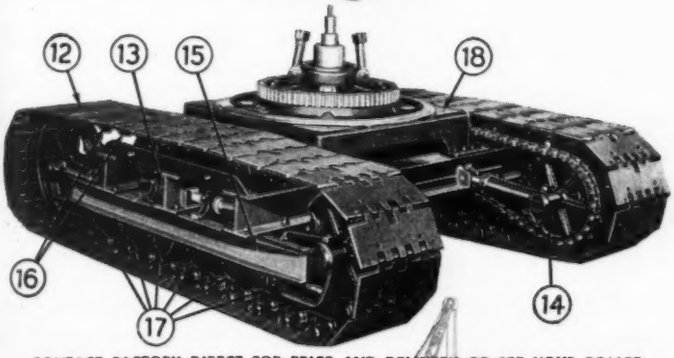
**7.** One-piece cast gear case completely encloses all gears and shafts in a constant flow of oil . . . Positive protection for all moving parts. Bored for perfect alignment by machine designed specifically for this accurate operation . . . misalignment is impossible.

**8.** Heat-treated alloy steel gears and shafts are involute splined. No keys to replace . . . no worn-out keyways. Large diameter shafts with short spans between bearings . . . minimizes deflection and bending . . . reduces bearing replacement.

**9.** Gas or Diesel engines are mounted in straight line with main machinery. Worm driven power take-off . . . silent, efficient, and compact.

**10.** All operating clutches are disc type . . . interchangeable . . . simple adjustment . . . mounted on high-speed countershafts instead of directly to drum shafts . . . smoother operation and longer life.

**11.** Turntable, Platforms, and Counterweight . . . These three important members are perfectly aligned, forming a single rigid unit that provides extra resistance to shocks and strains.




## LOWER STRUCTURE

**12.** Multiple hinged shoes maintain alignment . . . minimize wear of shoes and tumblers.

**13.** Single adjusting screw for adjusting tread belt and drive chain enclosed in grease, free from dirt, rust, or outside damage.

**14.** One-piece end bearings with added outboard bearings maintain perfect and permanent alignment of drive shaft and end roller shaft.

**15.** Husky trussed frame . . . reinforced by one-piece end castings.

**16.** Drive Sprocket guides . . . prevent treads from jumping off if operating too loose.

**17.** Idler rollers are drop forged alloy steel . . . manganese bronze bushed . . . Alemite lubrication.

**18.** Heavily ribbed and flanged lower frame (carbody) of annealed alloy steel . . . roller track cast integral with body.

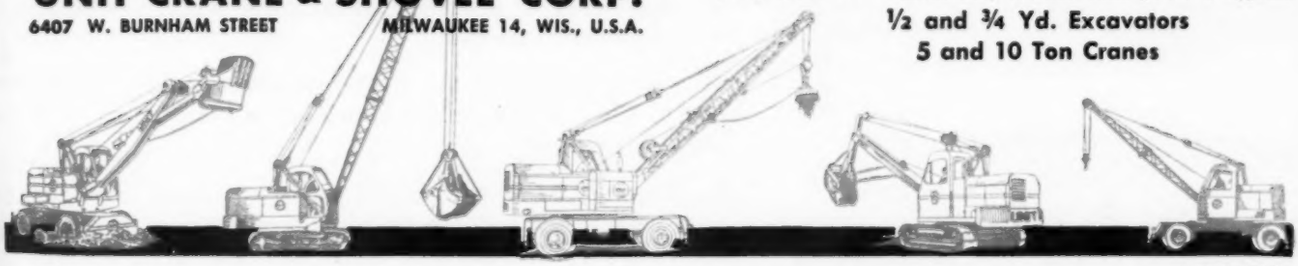
Automatic Traction Brakes are another exclusive UNIT feature! A friction type locking device for both crawlers . . . self-engaged by spring action . . . automatically released when power is applied.

CONTACT FACTORY DIRECT FOR PRICE AND DELIVERY OR SEE YOUR DEALER

**UNIT CRANE & SHOVEL CORP.**

6407 W. BURNHAM STREET MILWAUKEE 14, WIS., U.S.A.

**½ and ¾ Yd. Excavators**
**5 and 10 Ton Cranes**



A 5226-1PC-R

# JAEGER-ENGINEERED for

## Type "X" Diagonal Screed Finisher

### "teams" with today's mass-production pavers

*Front screed is transverse, rear screed is diagonal—pivots in either direction to whatever angle suits the work.*

**Re-Mixing-Compacting Spreader Gives 2-Paver Capacity with Minimum Paving Crew**

**The Jaeger 1948 model Concrete Spreader, teamed with a Jaeger Diagonal Screed Finisher, will spread and smoothly finish all the yardage you can pour with as many as two 34E dual drum pavers — makes paving a precision, mass-production operation done by power machinery. Re-mixing, compacting spreader screw, exclusive with Jaeger, eliminates segregation and resulting honeycomb, positively produces a denser, more uniform pavement than other spreading methods. Wide, oscillating strike-off can be furnished for concrete work or bituminous spreading-finishing.**

## FIRST BASIC IMPROVEMENT IN 31 YEARS

**Job-tested for 18 months, on highways from New York to California, the Type "X" Diagonal Screed Finisher now offers you six proved advantages for your 1948 paving work:**

1. ***More accurate than any transverse finisher:*** Diagonal rear screed, always meeting the material at a point different from the transverse front screed, equalizes irregularities due to forms or other causes, slices off high spots, fills in the low ones.

2. ***Less hand work and equipment needed behind finisher.***

3. ***Finishes flush to upper form on curve elevations and pitched slab:*** Angle of screed, controlled by operator, automatically carries material uphill and compacts it solidly against the top form.

4. ***Eliminates or greatly reduces carry-back, saving one to two shovelers' wages.***

5. ***Finishes faster without tearing, saves extra passes:*** Diagonal screed works final roll of material at an angle, a real advantage when finishing stiff mixes.

6. ***Capacity to match biggest pavers:*** Fast and flexible, with a wide range of screed speeds *all independent of traction,* finisher easily keeps pace with dual drum paver output on half-width or full-width work.

# labor-saving mass production

***Jaeger AIR PLUS Compressors help you do more work for wages paid . .***

Watch your production gain in yards of pavement broken, footage drilled, job progress made when you put a new AIR PLUS behind your tools. Delivers more and cooler air for every pound of fuel, maintains the steady 90 to 100 lbs. pressure that you need to keep tools working at their top efficiency and speed.

Compressors and engines are built to the same micro-precision standards. Valves are 75% to 100% larger for free air flow and "ultra lapped" to leakproof closure. Patented "Fuel Miser" control saves up to 32% of fuel. Engineered thruout to insure a dependable source of air, kept at "new machine" efficiency by service stations in 130 cities.

Sizes 60 to 600 cu. ft., trailer, truck, tractor or skid mounted.

***SURE PRIME — the only pumps with protected performance***

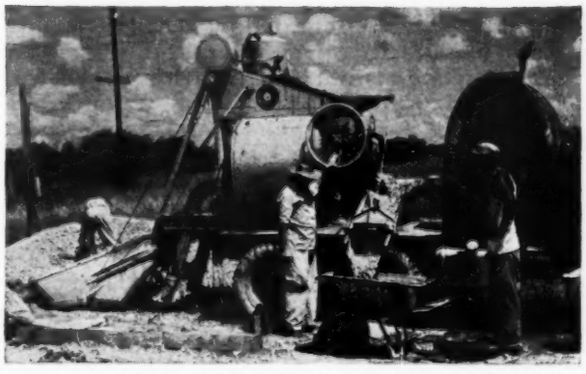
Extra-powered, conservatively rated and sure-primed by two separate, simultaneous actions, a Jaeger is a more efficient pump to start with. Over-all enclosures, exclusive with Jaeger, protect that efficiency with a dry, quick-starting, smooth running engine in all weather. Close-grained shell castings designed for high pressures, long-life Lubri-Seal, always accessible for inspection, and replaceable liners or seal rings mean extra years of low-cost service from any Jaeger pump.

Dewatering pumps from 1½" to 10", capacities to 240,000 gph; small, portable pressure pumps, diaphragm pumps, self-priming jetting pumps up to 250 lbs. pressure.

***SPEEDLINE Mixers pour it faster***

You can produce bigger daily yardage with the same size crew when you put a Jaeger on the mixing job. No other outfit has the Jaeger automatic "Skip Shaker" loader, criss-cross "dual mixing" action and fast "pressure" discharge of stiff concrete. There's extra advantage, too, in Jaeger's automotive type transmission, high carbon machined steel drum tracks and oversize engines protectively enclosed. They mean lower upkeep and insurance against breakdowns that no "light-weight" mixers can provide.

3½ to 16S sizes trail on Timken bearing wheels and springs. Also plaster-mortar mixers and portable cold-patch mixers.



***Sold, rented, serviced in 130 cities of U. S. and Canada. See your Jaeger distributor or send for latest Catalogs on above equipment, also 1948 model Bituminous Pavers, Hoists and Towers.***

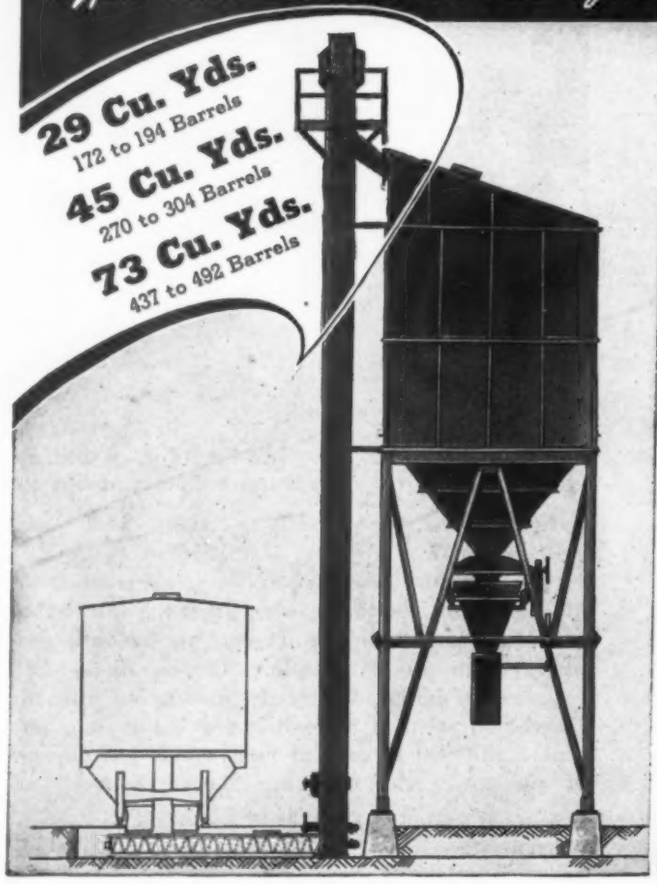
## THE JAEGER MACHINE CO., Columbus 16, Ohio

REGIONAL OFFICES: 1504 Widener Bldg., Philadelphia 7, Pa. • 226 N. La Salle St., Chicago 1, Ill. • 235 American Life Bldg., Birmingham 1, Ala.

# ERIE *Portable* CEMENT PLANTS

*Type "M" 3 Standard Sizes*

**29 Cu. Yds.**
172 to 194 Barrels
**45 Cu. Yds.**
270 to 304 Barrels
**73 Cu. Yds.**
437 to 492 Barrels

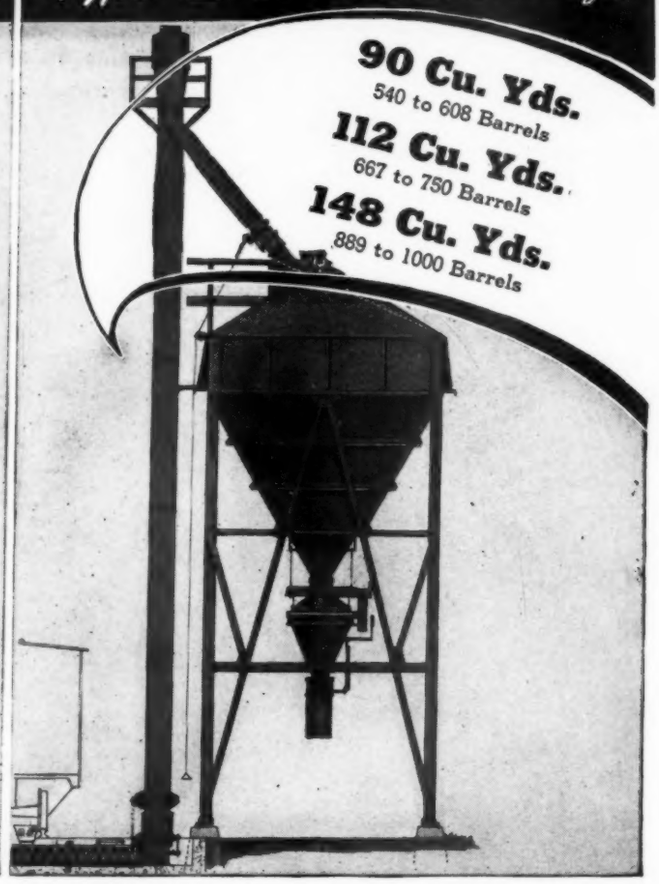


Type "M," a complete single compartment bulk cement storage and batching plant designed for easy portability. Made with 2 or 3 sections. This efficient, low cost plant eliminates all the inconvenience and waste from handling bag cement. A selection of weighing Cemeters provides accurate batching of cement to batch trucks and truck mixers. Write for Bulletin M.

# ERIE *Semi-Portable* CEMENT PLANTS

*Type "L" 3 Standard Sizes*

**90 Cu. Yds.**
540 to 608 Barrels
**112 Cu. Yds.**
667 to 750 Barrels
**148 Cu. Yds.**
889 to 1000 Barrels



Type "L" Cement Plants, semi-portable, knocked down type made in large bolted sections for fast field erection. Available in one or two compartments, each with a choice of 4 weighing Cemeters to provide accurate batching of bulk cement into batch trucks or truck mixers. 30 Ton per hour bucket elevator fed by undertrack screw from hopper bottom cars. Write for Bulletin L.

## ERIE STEEL CONSTRUCTION COMPANY

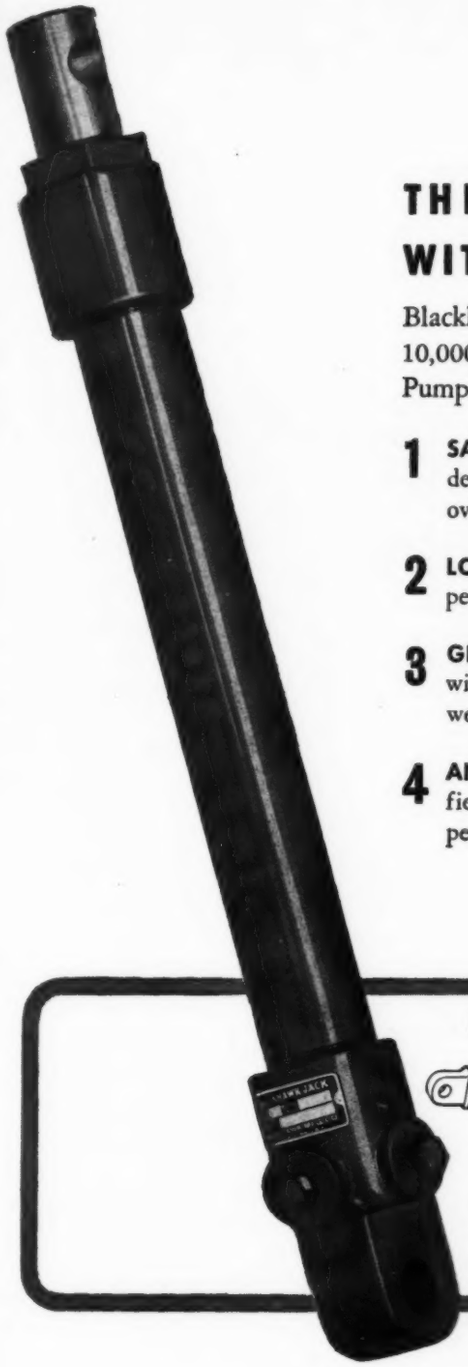
383 GEIST ROAD ERIE, PA., U. S. A.

### GENERAL PURPOSE CLAMSHELLS ○ PORTABLE CONCRETE PLANTS

One of 10 Erie types of buckets available in 11 standard sizes from ¼ to 2½ Cu. Yard, incorporating the block and tackle plus leverage principles with selective reeving for speed and power. Steel castings and forgings with welded steel plate construction are combined in a low-head design for greatest digging durability. Write for booklet on general purpose buckets.

Erie combines on an 8 rubber tired chassis, a complete concrete making plant. It includes 20 cu. yd., 3 part storage bin, vertical bucket elevator, Weighing Aggre-Meter with extra beam for measuring water. All bin gates are hydraulically operated by fingertip action. Make concrete where you use it. Write for new booklet.

# RAMS . . . FOR HAND OPERATED AND POWER-DRIVEN SYSTEMS



## THESE *Basic Benefits* ARE YOURS WITH BLACKHAWK HYDRAULIC RAMS

Blackhawk Hydraulic Rams are designed for high pressures up to 10,000 lbs. per sq. inch as developed in conjunction with Blackhawk Pumps. This type of ram construction produces these benefits:

1 **SAVINGS IN SPACE** permit easier installation in tight places . . . less design change in present equipment . . . greater opportunity to create overall compactness.

2 **LOWER COSTS** are achieved through material-savings and add to competitive sales advantages for the equipment manufacturer.

3 **GREATER EFFICIENCY** is created because smaller ram diameters (along with more compact pumps, valves and fittings) mean less friction, less wear, longer life — greater user-satisfaction.

4 **AN EXCLUSIVE** combination of construction features, including simplified design, fewer parts and proper choice of materials, help create dependable, maintenance-free performance.

### HOW HIGH-PRESSURE SAVES COST AND SPACE

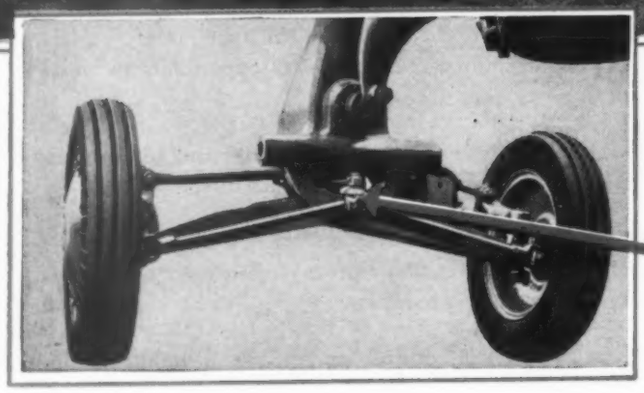
Rams sketched above represent equal load-lifting ability. But the Blackhawk has only 25% the weight of the other ram. Example: A 1-5/8" diameter ram in a Blackhawk *High-Pressure* system delivers the same force exerted by a ram of 3-9/16" diameter in a conventional low-pressure system.

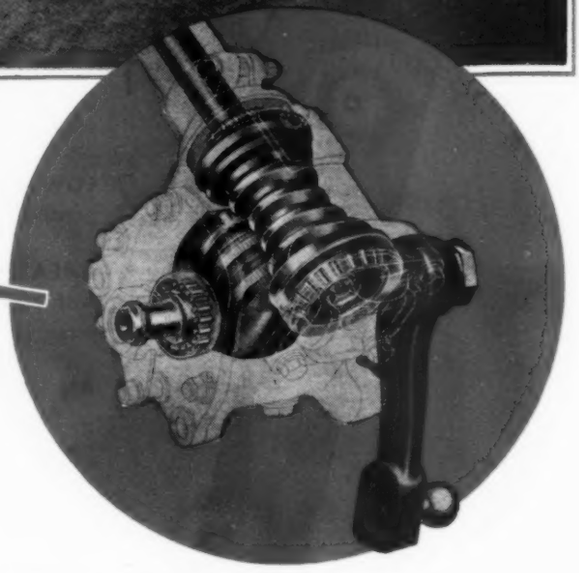
**TO EQUIPMENT MANUFACTURERS.** Blackhawk Hydraulic Controls (Pumps, Rams and Valves) are engineered and priced for quantity purchases and installation on the products of other manufacturers. Submit your hydraulic problems to us. We will work with you in confidence.

*A Product of* **BLACKHAWK MFG. CO., Dept. RS-38, Milwaukee 1, Wisconsin**

# BLACKHAWK

**WORLD'S LARGEST MANUFACTURER OF HIGH-PRESSURE HYDRAULIC EQUIPMENT**





# GEMMER
# EASY STEERING

## Helps the AD *Motor Grader* Do Tough Jobs Easily

Allis-Chalmers Co. chose Gemmer Easy Steering for this hard working AD Motor Grader because steering has to be right in such a vehicle.

The Gemmer worm and roller tooth principle makes the AD Motor Grader steer easily—as it has motor vehicles of all types. Gemmer pioneered easy steering in the automotive industry.

Gemmer Steering Gears are compact, sturdy, simple. They rarely need adjustment, and with reasonable care will last the life of the vehicle.

Gemmer Steering is always firm, responsive, positive, with absence of rubbery feeling or wander.

3188

**GEMMER MANUFACTURING COMPANY**
6400 MT. ELLIOTT · DETROIT 11, MICHIGAN

# NEW

## COMPLETE LINE
## GORMAN-RUPP CONTRACTOR'S PUMPS

Gorman-Rupp Self-Priming Centrifugal Pumps have long led the industry in performance and dependability. NOW! Gorman-Rupp goes further ahead with a NEW LINE OF CONTRACTOR'S PUMPS. Streamlined inside, where streamlining counts, these new pumps are the Quickest Priming, Fastest Pumping, Never-Quit Pumps available.

Take quick priming: the New Model 40M 4" pump primes at 20 ft. suction in 33 seconds; at 30 ft. suction in 67 seconds. The New Model 90M 6" primes at 30 ft. suction in 80 seconds.*

Our challenge is no idle gesture. We want YOU to give these pumps an on-the-job test for your own satisfaction. We back our claims with this guarantee!

### THE GORMAN-RUPP GUARANTEE

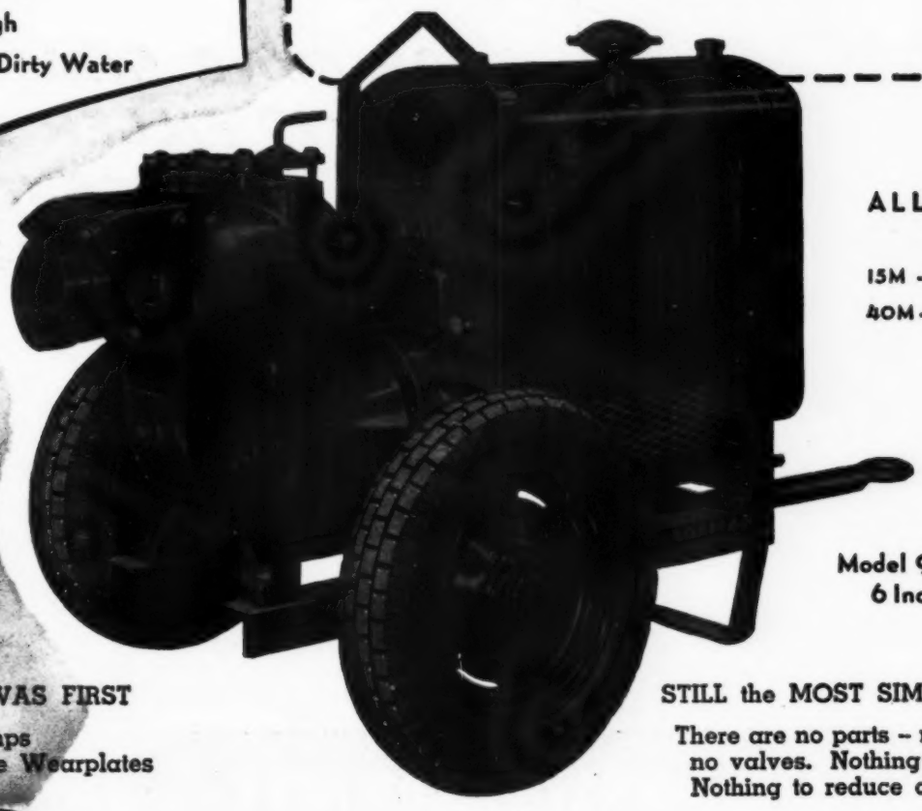
Our distributors are authorized to put a Gorman-Rupp Contractor's Pump on any pumping job, anytime, anywhere, alongside any other make pump, size for size. The Gorman-Rupp pump is guaranteed to pump more dirty water, more hours, using less gasoline, to prime quicker and at higher suction lifts than any other self-priming pump. If it isn't the best all around pump, our distributor will accept the return of the Gorman-Rupp pump and pay the user any installation expense incurred.

* Sea level. Performance data inquiries invited.

*Challenging*

**ANY CONTRACTOR'S PUMP, SIZE FOR SIZE, TO**

1. Prime as Quick
2. Prime as High
3. Pump More Dirty Water



**ALL SIZES**
7M - 10M
15M - 20M - 30M
40M - 90M - 125M

Model 90M
6 Inch

**GORMAN-RUPP WAS FIRST**
- To Build Blue Pumps
- To Use Renewable Wearplates

**STILL the MOST SIMPLE PUMP**

There are no parts -- no ports -- no valves. Nothing to clog. Nothing to reduce capacity.

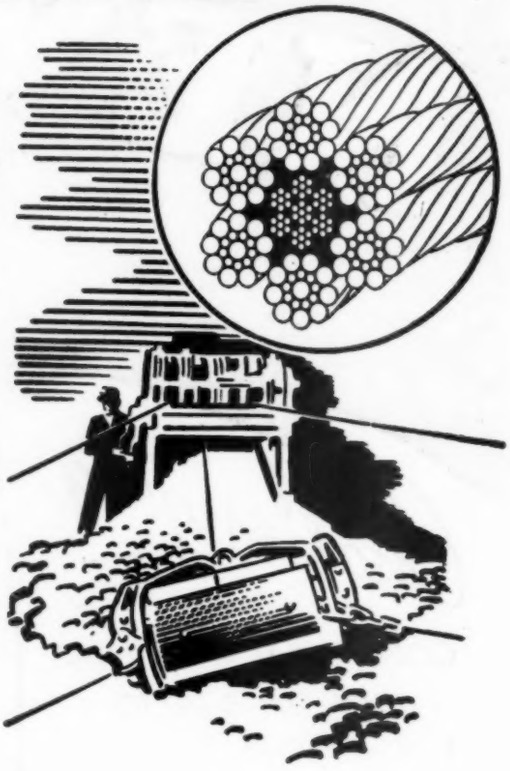
*Write for the new Contractor's Pump Bulletin 8-CP-11.*

**THE GORMAN-RUPP COMPANY**

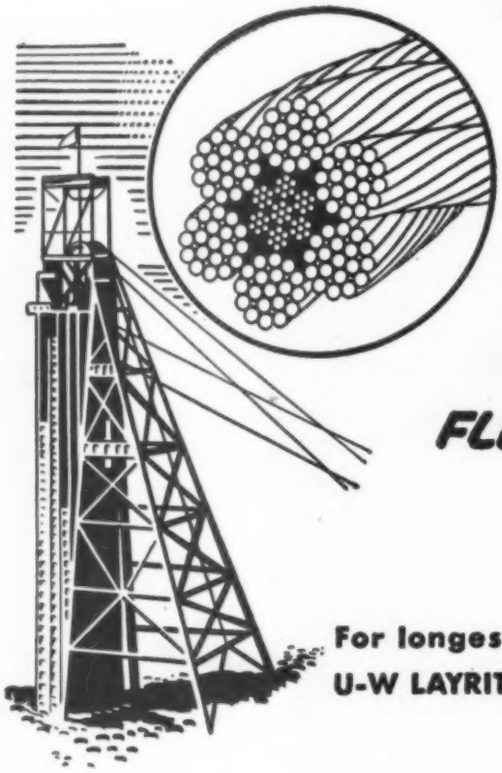
323 N. BOWMAN ST. MANSFIELD, OHIO

# SOME ROPES FOOL YOU

**U-W 6×19 SEALE IS AN EXCELLENT CONSTRUCTION FOR SLUSHER OR SCRAPER PULL ROPES BECAUSE IT HAS VERY COARSE OUTER WIRES TO RESIST ABRASION**



**BUT...**



**FOR MINE SHAFT ROPES U-W 6×19 FILLER WIRE IS BETTER BECAUSE IT IS MORE FLEXIBLE AND RESISTS FATIGUE EXCEPTIONALLY WELL.**

**For longest and best service, always specify U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL**

*We invite you to let UPSON-WALTON engineer your tough rope jobs.*

Copyright 1948 – The Upson-Walton Company

## THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

*Main Offices and Factory: Cleveland 13, Ohio*

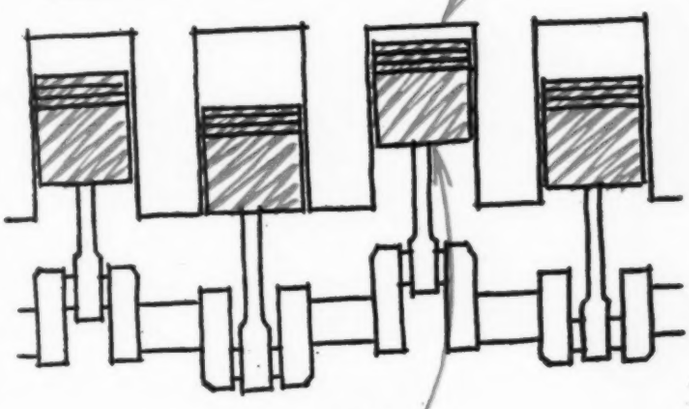
114 Broad Street, New York 4 | 737 W. Van Buren Street, Chicago 7 | 241 Oliver Building, Pittsburgh 22

# LUBE MEMO

*Engine overheating caused by stuck rings*

Compression loss 30%

400 400 280 400



Hot blowby gases burned piston.

Shop found rings in #2 badly stuck by ordinary oil (blowby has been wasting power).

Foreman claims RPM DELO Diesel Engine Lubricating Oil's compounds will prevent stuck rings 3 ways:

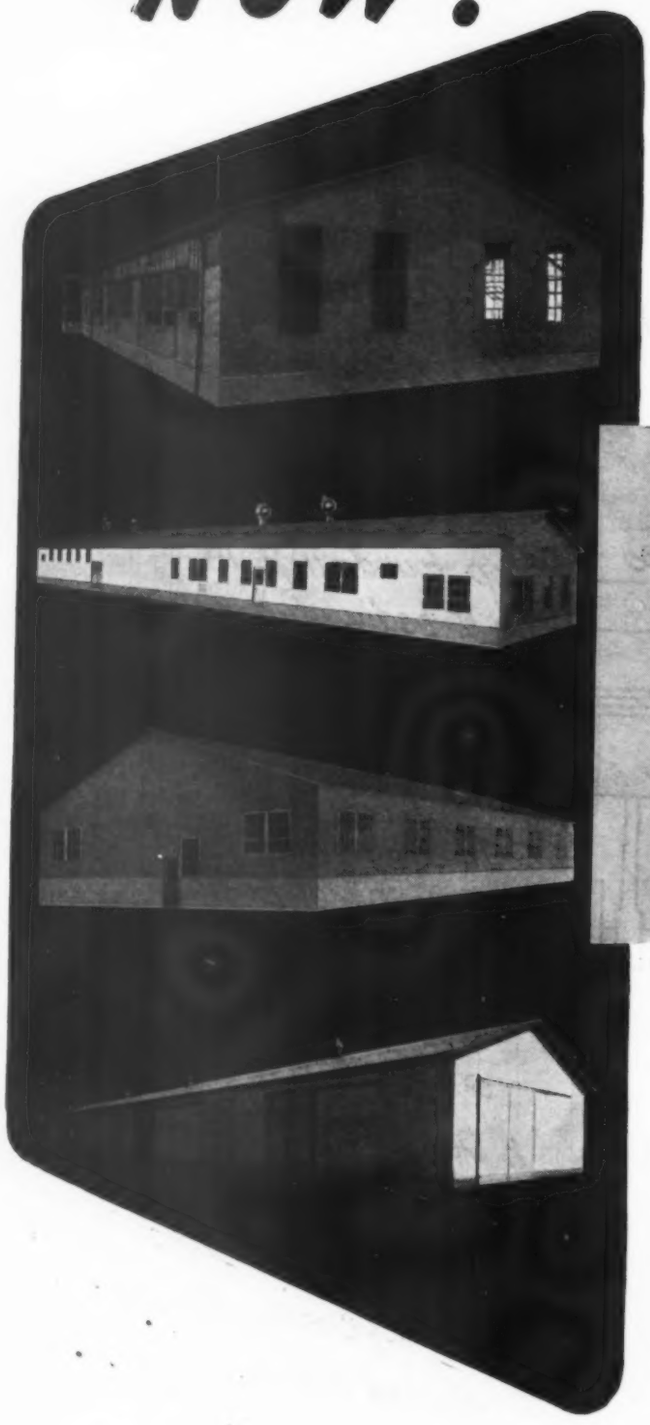
1. Decrease carbon
2. Stop formation of gum.
3. Hold contaminants in suspension (they're flushed out on oil change).

Give shop go ahead on RPM DELO Oil

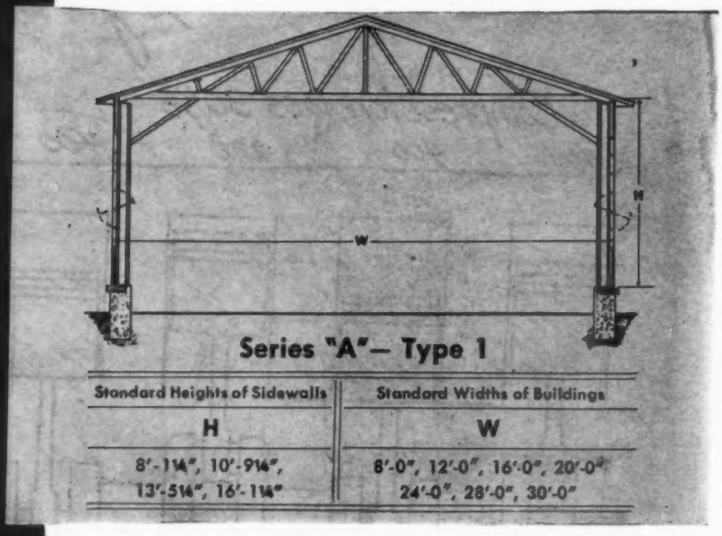
DIESEL ENGINE RPM DELO LUBRICATING OIL

STANDARD OF CALIFORNIA • San Francisco, Calif. THE CALIFORNIA OIL COMPANY • New York
THE CALIFORNIA COMPANY • Denver, Colo. STANDARD OF TEXAS • El Paso, Texas

# NOW! Prompt Delivery of TRUSCON STEEL BUILDINGS



**In sizes not exceeding 30'-0" in width, 16'-1¼" in height and lengths in multiples of 4'-0".**




**Series "A"— Type 1**

| Standard Heights of Sidewalls | Standard Widths of Buildings |
|---|---|
| H | W |
| 8'-1¼", 10'-9¼", 13'-5¼", 16'-1¼" | 8'-0", 12'-0", 16'-0", 20'-0" 24'-0", 28'-0", 30'-0" |

## The Answer to your Needs for Additional Buildings RIGHT NOW!

● Meet today's needs for more enclosures by building or enlarging with Truscon Standardized Steel Buildings. Standard designs, prefabricated, highly versatile and adaptable. Features include fire protection, permanence, ease and speed of erection, low upkeep, quick dismantling and re-erection, low cost and high investment value. Buildings are available with either interlocking painted steel or 18 gauge 1½ inch Ferrobord roof with insulation and waterproofing. Truscon engineers will give you experienced planning help for any need—write now!

**TRUSCON STEEL COMPANY**
Reg. U. S. Pat. Off.
YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation

**Manufacturers of a Complete Line of Welded Steel Fabric . . . Concrete Bars . . . Contraction Joints . . . Dowel Assembly Units . . . Curb Bars . . . Complete Steel Buildings.**

## The job

**Producing 1,100,000 tons of aggregates**

## The equipment

**A Cedarapids Master Tandem**

Cedarapids Built by IOWA

## The contractor

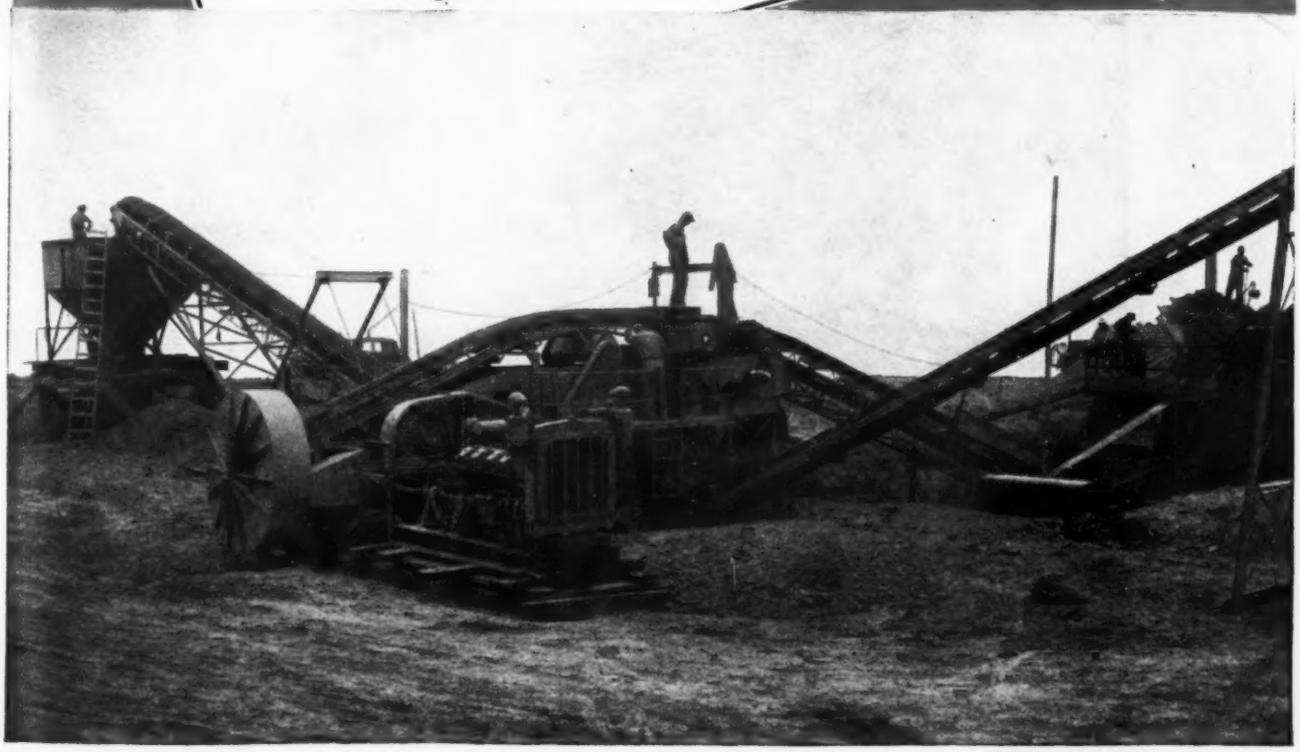
**Morrison-Knudsen Company Inc., Boise, Idaho**

THE M-K symbol and the Cedarapids trade-mark on the equipment producing aggregates for so many of the largest and toughest construction jobs all over the world have long been familiar sights.

For example, a Cedarapids Master Tandem has produced 1,100,000 tons of aggregates for nine different M-K jobs, some of them hundreds of miles apart. 213,400 tons of concrete aggregates, 132,200 tons of plant-mix aggregates, 746,000 tons of base material for pavement and 8,400 tons of miscellaneous material is the record accumulated by this one machine. This combination of portability, high capacity, flexibility and long, dependable service has helped Morrison-Knudsen complete their contracts on time.

When you buy aggregate producing equipment, follow the lead of contractors who know construction equipment best — buy Cedarapids.

**Iowa Manufacturing Company**
**Cedar Rapids, Iowa, U. S. A.**



**THE IOWA LINE** *of Material Handling Equipment Includes*

PRODUCT OF IOWA

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS – STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
FEEDERS
TRAPS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

# GOOD KEEP GOOD

**DETROIT DIESEL ENGINE DIVISION**

SINGLE ENGINES.. *Up to 200 H.P.* **DETROIT 28, MICHIGAN** MULTIPLE UNITS.. *Up to 800 H.P.*

**GENERAL MOTORS**

GM
GENERAL MOTORS
DIESEL POWER

# DIESELS COMPANY

Every day more and more well-known manufacturers of contractors equipment and other machinery are offering the General Motors Series 71 2-cycle Diesel engine as power for their products.

The reason is clear. These tough, dependable Diesels provide great power in moderate space. They start easily—pick up their load fast—run smoothly and use a minimum of low cost fuel.

GM 2-cycle Diesels produce power at every piston downstroke. They are designed for easier servicing; have no high-pressure fuel lines and offer a maximum of interchangeability of parts, engine for engine.

These are the factors which, together with Detroit Diesel's owner service policy and warranty, have earned for GM Diesel its enviable reputation.

## LEADING MANUFACTURERS OF THE FOLLOWING EQUIPMENT OFFER GM SERIES 71 DIESEL ENGINES IN THEIR PRODUCTS:

Air Compressors
Arc Welders
Asphalt Plants
Buses
Cableways
Cranes
Distillation Equipment
Ditchers
Draglines
Dredges
Earthmoving Loaders
Evaporation Units
Feed Mills
Fire Pumps
Hoists
Industrial Locomotives
Locomotive Cranes
Logging Loaders
Logging Yarders
Mining Pumps
Motor Graders
Off-The-Road Vehicles
Oil Field Equipment
Pavers
Power Scrapers
Pumps
Road Rollers
Rock Crushers
Rotary Soil Tillers
Saw Mills
Screening Plants
Shovels
Soil Stabilizers
Stave Mills
Tractors
Trucks
Wellpoint Pumps

***IT'S WISE FOR YOU TO SPECIFY GM DIESEL***

# TO MOVE LOADS AND EQUIPMENT

# *Faster and at Lower Cost...*

## HAVE YOUR GENERAL TIRE DEALER SPECIFY, INSTALL AND SERVICE THE TIRES FOR THE JOB!

**The General Earth-Mover** for free-rolling wheels is designed to ride higher, roll more easily and use less energy from the power wheels. The self-cleaning tread is made up of thick, bold-faced blocks which spread the load weight evenly and protect the carcass against cutting and bruising. Easy-flexing tire body absorbs obstructions that would injure a hard tire. Those who use it know... this tire moves more yards of dirt faster, and at lower cost.

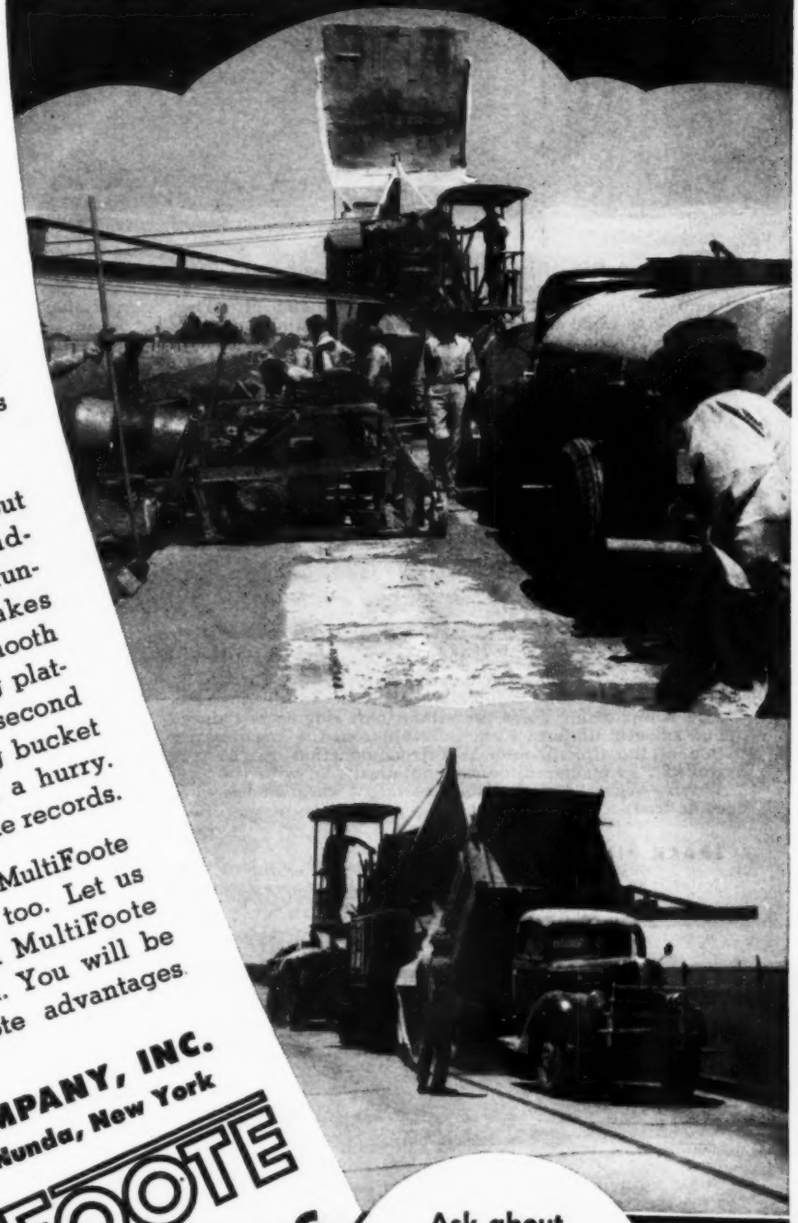
**General Non-Directional Cleated Tire** is unsurpassed for extra drive wheel traction in soft ground, sand or gravel. Equal traction is developed forward or backward, making this tire well suited for cranes, shovels or dump trucks. A wide center rib provides an easy steering, smooth ride on the highway, and assists in the long wear qualities built into the tire... from reinforced bead to extra thick tread. Shock absorber construction absorbs bumps that would become bruises.

The GENERAL TIRE

**The General L. C. M.** has proved itself as the outstanding truck tire for hard, heavy hauling where extreme tire strength and exceptional traction requirements are the deciding factors. With the "V" of the power cleats pointing forward, drive wheels are ready to go through almost any kind of mud, slush or poor road condition; yet there is no sway and little noise on the highway. With the "V" of the power cleats pointing backward, The L. C. M. is suitable for power wheels that spend part of their time on paved roads, for drawn wheels... for long, even wear and enormous load capacity.

**THE GENERAL TIRE & RUBBER COMPANY**
*AKRON, OHIO*

# MAKING THE NATION'S GREATEST HIGHWAY SAFER IN RECORD TIME!



● The day this picture was made the Austin Road Company of Dallas, Texas laid 8,220 ft. of 3 ft. shoulder to widen Route 66 east of Amarillo. In spite of the fact that traffic was maintained, high daily output placements ran up to 8,500 ft.

Simple equipment, a well coordinated organization and a MultiFoote 34-E Paver made this record possible!

One of the outstanding things about MultiFoote Pavers is their dependability. They are built to keep a' running. Simplicity of design makes upkeep and adjustment easy. Smooth control from the high operating platform, the wide skip, the split-second discharge and the fast acting bucket get material on the road in a hurry. These are the things that make records.

You can have this same MultiFoote performance on your jobs too. Let us send you the details on MultiFoote design and construction. You will be interested in MultiFoote advantages.

**THE FOOTE COMPANY, INC.**
**1936 State Street, Nunda, New York**

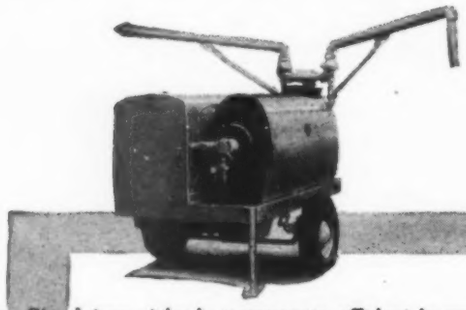
**MULTIFOOTE CONCRETE PAVERS**

Ask about the MultiFoote Duo Mix (Dual Drum Paver) and the Adnun Black Top Paver

*Builders of*
Adnun Black Top Pavers, MultiFoote Concrete Pavers and Foote Kinetic Mixers

# BROS Construction EQUIPMENT

### TANK CAR CIRCULATORS

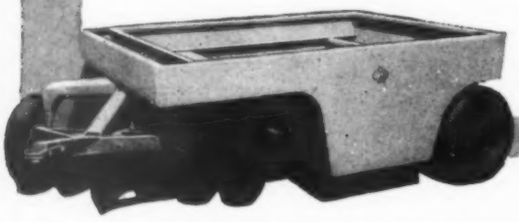


*Bros* Circulators—trim in appearance, efficient in operation—have no equal for heating asphalt. They reach high temperatures faster and do the job more economically. They operate as rapid transfer units with four distinct pumping speeds. The *Bros* Circulator takes only 2 to 3 hours to fully heat and unload a 10,000 gallon pumpable tank car.

### STEAM GENERATORS

Full steam pressure in 20 minutes from a cold start is possible with the *Bros* Packaged Steam Generator. This streamlined, portable all-purpose unit meets the need for high pressure steam on a multitude of jobs . . . for bitumens in tank cars, for storage tanks, for thawing culverts and refrigerator cars and for stationary power plants.

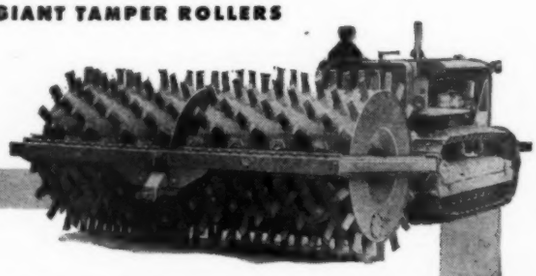
### PNEUMATIC TIRE ROLLERS



Only *Bros* makes the Wobble-Wheel* Roller for flowing pressure compaction. Voids are eliminated, ridging is reduced and smooth, uniform surfaces result from the kneading action of the *Bros* Wobble-Wheel. Compaction can be controlled . . . maximum density obtained . . . with the *Bros* Wobble-Wheel. Also available in straight wheel models when so desired.

**Patented*

### GIANT TAMPER ROLLERS

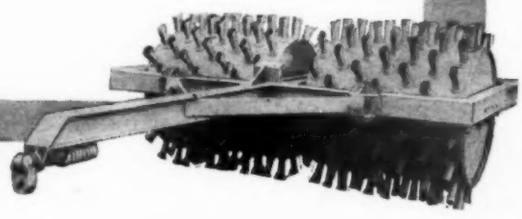


New heavy duty tamping rollers, designed by *Bros*, meet compaction requirements of earth dams, airport runways and super-highways. Individually oscillating drums, 76 inches in overall diameter, carry diamond-shaped feet with an average pressure per foot of from 2,350 lbs. to 5,660 lbs. A box type frame completely surrounds the drums with a drawbar that both pushes and pulls for best load distribution.

### TRACK PIN PRESSES

Speed, economy and power combine in the *Bros* Track Pin Press for the toughest hydraulic jobs. Only 20 seconds are required for a full 13 inch stroke against 100 ton pressure. Available in both semi-trailer and stationary models, its simple design means easy maintenance and operation. An automatic shut-off saves power.

### SHEEPSFOOT ROLLERS



Faster, cleaner tamping is possible with the *Bros* Sheepsfoot Tamper which compacts more area with equal unit pressure. The *Bros* tamper foot, made of long-wearing forged steel with thick-end wear pad, has no corners to pick up and hold dirt. An efficient cleaner tooth clears mud and dirt from between the feet assuring top efficiency with every pass.

*Modern Pioneers in Compaction*

**BROS**

*Better Tools For Construction*

**WM. BROS BOILER AND MFG. COMPANY, MINNEAPOLIS 14, MINNESOTA**

# GOING PLACES FAST

CAPACITY: (normal conditions per hour) shovel or dragline — 60 yards; trench hoe — 100 feet of 5 foot ditch.

LOADING FROM STOCK PILE

TRENCHING WITH "MOLES PAW"

DRAGLINE OPERATION

CLAM SHELL MOUNTED ON HALF TRACKS

## THE 1/3 YARD SCHIELD BANTAM

**TRUCK MOUNTED POWER SHOVEL • TRENCH HOE**
**DRAGLINE • CLAM • PILEDRIVER • CRANE**

Just as soon as you finish one job the BANTAM is ready to make profits on the next. No delays dismantling and loading on trailers. It mounts on any 1½ ton truck and speeds across town or across country. Drives up to the job and digs in. Changing from shovel to trench hoe, dragline, clam, piledriver or crane is a matter of minutes. Interchangeable booms and buckets are designed for rapid installation. Split-type laggings permit proper line speeds and assure high performance on all operations.

Unequalled for performance in close quarters, the BANTAM makes money on jobs where heavy equipment is unprofitable. Its full circle design and smooth, FAST CYCLE operation piles up yardage. All major assemblies roll on *ball bearings* for easier handling and longer service life. Its high strength alloy construction is built to take tough going.

There's a BANTAM near you. Climb into the roomy cab and learn first hand about its versatility, mobility, easy operation and capacity for getting jobs done. You'll see why it's going places as a real money-maker.

*Write for Complete Details*

**THE SCHIELD BANTAM CO., INC.**
**203 PARK STREET • WAVERLY, IOWA**

***Sold and Serviced by***

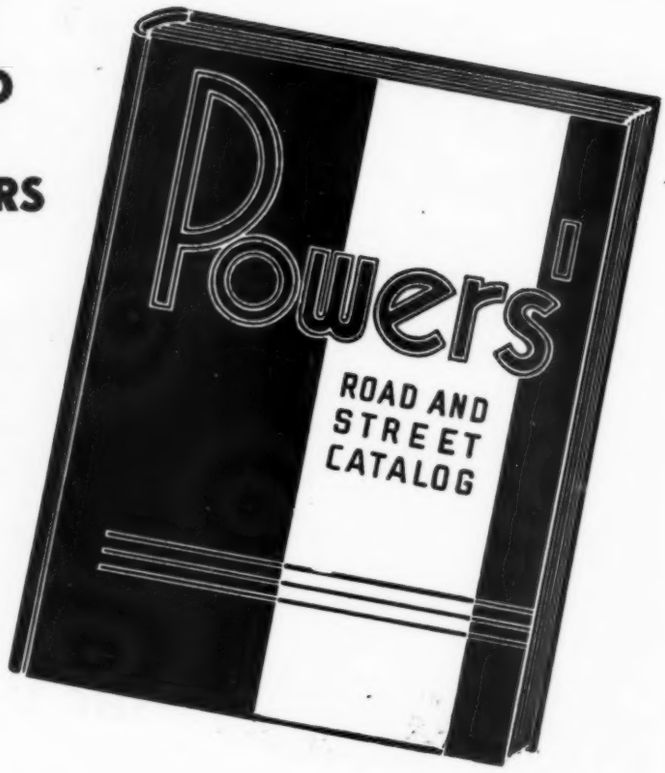
**LEADING CONSTRUCTION EQUIPMENT DISTRIBUTORS**

# MORE THAN 10,000 CATALOGS DISTRIBUTED

# MORE THAN 100,000 USERS

## *Next Edition Coming Up*

**HAVE YOU MADE YOUR RESERVATION?**




***"Catalog is always within reaching distance. Wouldn't be without it!"***

**A State Highway Engineer made this comment, but practically the same thing has been said by County, City and Federal Engineers; Road and Street Contractors, and Airport Engineers and Managers.**

**Comments come pouring in from every part of the field in praise of the Catalog and asking to be kept on the list to receive the next edition.**

**Requests come from the men who plan and design, construct and maintain the roads and streets of the Nation. They are the State, Federal, City and County Engineers; Chairmen of County Boards; Directors of Public Works; Engineers of National Parks and Forests; and Airport Managers and Engineers. They are the Highway and Heavy Construction Contractors who furnish the major market for the purchase of road building equipment and materials.**

**POWERS' ROAD AND STREET CATALOG offers the most economical and satisfactory method of placing your Catalog information where it will be constantly available to the man "who wants what he wants when he wants it." Here in one compact reference book is all the necessary information on all types of equipment and materials, indexed for easy reference, with names and addresses of nearest equipment dealers.**

**It is estimated that expenditures for maintenance alone this year will reach the billion dollar mark. To this will be added another billion for new construction and improvements. Step up your advertising for increased buying tempo in this huge market for road building and maintenance equipment and supplies.**

## AUDITED CIRCULATION — FLEXIBLE CCA

**Rate card sent upon request**

**Write for booklet "What Users and Buyers Want to Know About Care and Maintenance of Equipment."**

**Gillette PUBLISHING COMPANY**
**22 West Maple St., Chicago 10, Ill.**
**NEW YORK • CLEVELAND • LOS ANGELES**
**SAN FRANCISCO**

"QUICK-WAY"*
TRUCK SHOVELS
BUILD BIGGER PROFITS
"QUICK-WAY" PORTABILITY
Correctly balanced for truck mounting and for strength with lightness. Travels on or off the road at truck speed.
"QUICK-WAY" ECONOMY
Low initial investment, low maintenance. Many equally efficient attachments for one operating unit—on one chassis.
"QUICK-WAY" INTERCHANGEABILITY
All parts of clutches, brake bands, hydraulic cylinders in clutches and control cabinet and many bearings are interchangeable.
"QUICK-WAY" OPERATING SPEED
Fast hoist and swing action mean more material moved per man hour—more profit on every job.
"QUICK-WAY" CONVERTIBILITY
Convertible in MINUTES from shovel to dragline, clamshell, crane, trench-hoe, pile driver, scoop, or backfiller.

Any man who owns one or more **"QUICK-WAY"** will tell you they're big money-makers. Ask him why and he'll give you many good reasons. Watch a **"QUICK-WAY"** operate and you'll see for yourself that he's 100% right.

Regardless of what equipment you own, you need **"QUICK-WAYS"** too. Theres a **"QUICK-WAY"** owner near you: ask HIM.

**Model E: 4/10 cu. yd. cap. for mounting on any standard 5-ton truck.**
**Model J: 1/4 cu. yd. cap. for mounting on any standard 1½-ton truck.**

**Service available from our Distributors, strategically located throughout U. S. and worldwide.**

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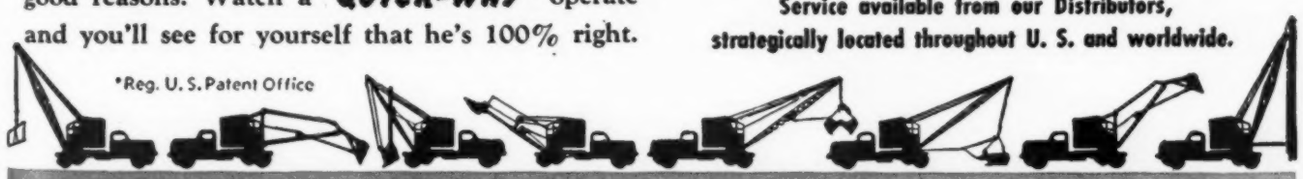

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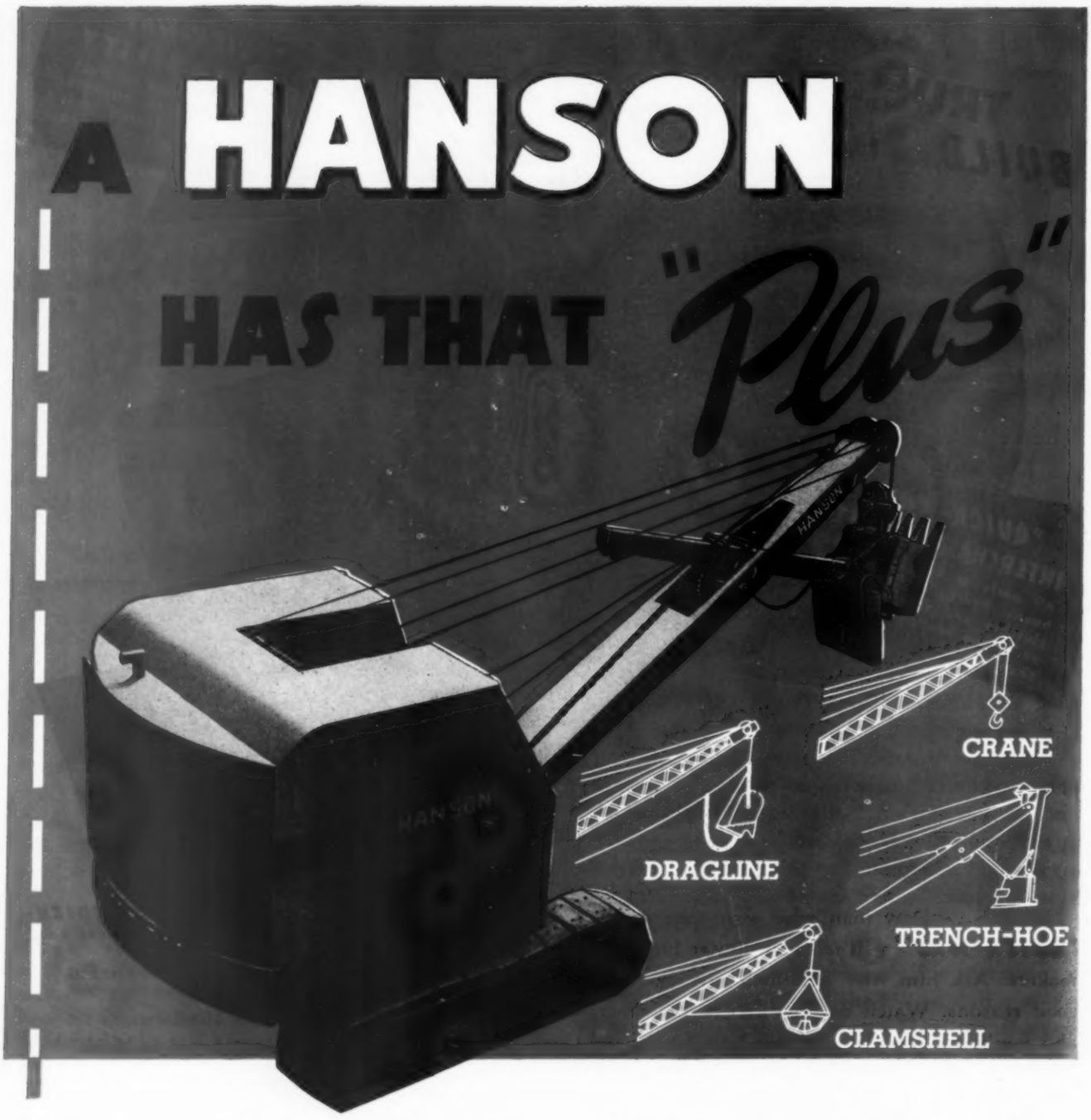


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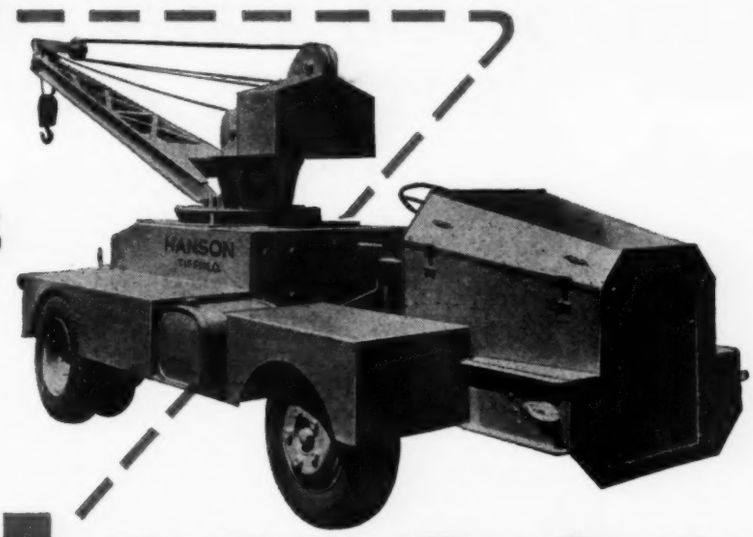


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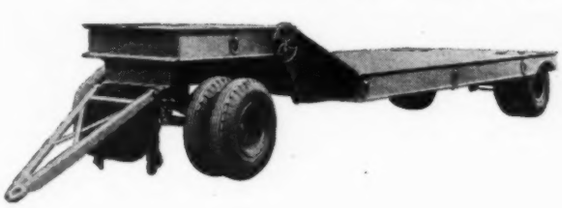

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# ROAD AND STREET CONSTRUCTION METHODS AND COSTS

## A NEW BOOK OF DATA

By

**HALBERT P. GILLETTE and JOHN C. BLACK**

This book was planned expressly for use by contractors, engineers and highway officials.

It is not a textbook, but a compendium of data, carefully selected with reference to their usability by highway builders and other persons concerned with highway construction costs.

In general the data are of two main classes—dollar and cents costs per mile, per square yard, per cubic yard, and the like, for use in quick approximate estimates; and details of material, labor and equipment costs, with records of man-hours and machine-hours, for use in close estimating and in studies to reduce costs or improve methods.

The data are from a great number of different sources, and are in widely varying detail.

All major articles carry descriptions to show clearly the class of work and the methods for which costs are given, and to provide a basis for further reference and study if desired.

Location and date of job and the source of information are given in the title and introduction to each article.

The grouping of subjects in chapters is convenient, but an unusually complete index is furnished as the main guide to any subject or sub-subject sought.

The authors are both men of practical experience in highway and other construction. Both are members of the American Society of Civil Engineers.

### OUTLINE OF CONTENTS

**CHAPTER 1. INTRODUCTION**—Brief discussions of construction costs, prices, profits and the uses of cost data.

**CHAPTER 2. COST INDEXES**—Indexes of the U. S. Public Roads Administration and Interstate Commerce Commission, with brief explanations of their construction, uses and limitations

**CHAPTER 3. OVERHEAD COSTS**—Separate discussions of the overheads incurred by contractors and by states, counties and cities.

**CHAPTER 4. ENGINEERING**—Data from states, cities and other sources on the costs of various kinds of surveys and other engineering. There are brief articles on aerial surveys and seismographic soil and rock surveys.

**CHAPTER 5. RIGHT-OF-WAY**—A general discussion followed by records of actual experience and costs.

**CHAPTER 6. EQUIPMENT**—This chapter contains several rental and ownership expense schedules in full detail, followed by articles on operating and maintenance costs, including records of fuels, lubricants, etc., a mathematical analysis of the problems of selecting and retiring machines, and a table of depreciation rates.

**CHAPTER 7. LABOR**—Schedules of established minimum wage scales and records of wage rates in various states; comparisons of contract work and day labor; convict labor costs and other pertinent matter.

**CHAPTER 8. CLEARING AND GRUBBING**—Records of clearing with tractor-mounted equipment, hand and horse methods, stump blasting, etc.

**CHAPTER 9. GRADING**—Eighty-four pages of articles on grading with power shovels, scrapers of various types and sizes, elevators, blade graders, bulldozers, etc.; hydraulic grading; rock drilling and blasting; winter grading; special swamp grading; minor operations and hand work.

**CHAPTER 10. HAULING AND HANDLING MATERIALS**—Studies of hauling operations on power shovel jobs, concrete construction and bituminous construction; truck movements at yards; industrial railways; team and wagon hauling; and other articles

**CHAPTER 11. PRODUCTION OF AGGREGATES**—Articles on labor requirements and costs of producing sand, gravel and crushed stone at various locations.

**CHAPTER 12. UNTREATED BASES AND SURFACES**—Waterbound macadam, crushed rock and gravel construction.

**CHAPTER 13. STABILIZATION OF BASES AND SURFACES**—This chapter is devoted chiefly to work with calcium chloride, articles on portland cement and bituminous stabilization being given in the chapters on concrete and bituminous construction.

**CHAPTER 14. BITUMINOUS SURFACES AND BASES**—The five parts of this long chapter contain articles on various methods in different states: Part 1. Surface Treatments; Part 2. Bituminous Macadam; Part 3. Mixed-in-Place Construction; Part 4. Traveling Plant Construction; Part 5, Stationary Plant Construction.

**CHAPTER 15. CONCRETE SURFACES AND BASES**—Contains numerous detailed records of construction. There are articles on work with 27-E pavers, 34-E pavers, tandem set-ups, batching, hauling, curing, joints, cement-bound macadam, soil-cement roads, stabilization, and other subjects.

**CHAPTER 16. BRICK PAVEMENTS**—Records of brick pavement construction from various cities and states, including an article on vibrated monolithic. Short reference to granite block

**CHAPTER 17. SIDEWALKS, CURBS AND GUTTERS**—Miscellaneous prices and details of construction.

**CHAPTER 18. WALLS, FENCES AND GUARD RAILS**—A brief chapter of data on these items of highway construction.

**CHAPTER 19. BRIDGES AND CULVERTS**—Cost data on a large number of steel, concrete and timber bridges and grade separations—also culverts of various types. There are two articles on pump installations for underpass drainage.

**CHAPTER 20. TUNNEL CONSTRUCTION**—Detailed descriptions and data on the construction of 27 highway tunnels in the West.

**CHAPTER 21. GRASS, SHRUBS AND TREES**—Several articles on plantings for landscape improvement and protection.

**CHAPTER 22. MISCELLANEOUS**—Data on pedestrian underpasses, street car loading platforms, truck weighing stations, catch basins and manholes, lignin binder, water pumping, signs and markers, traffic striping, parking metars, highway lighting, radio communication with snow plows, accident prevention, and weather and construction.

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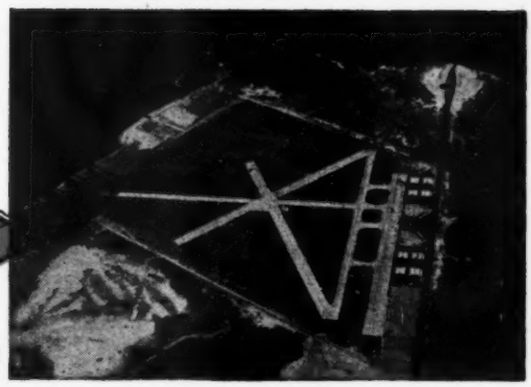
# What's the Weakest Spot in a Backbone?



WHAT BACKBONE? Transportation's backbone. The concrete highways that cross our country . . . North, South, East and West. The paved airport runways on which great airliners must start and end each trip.

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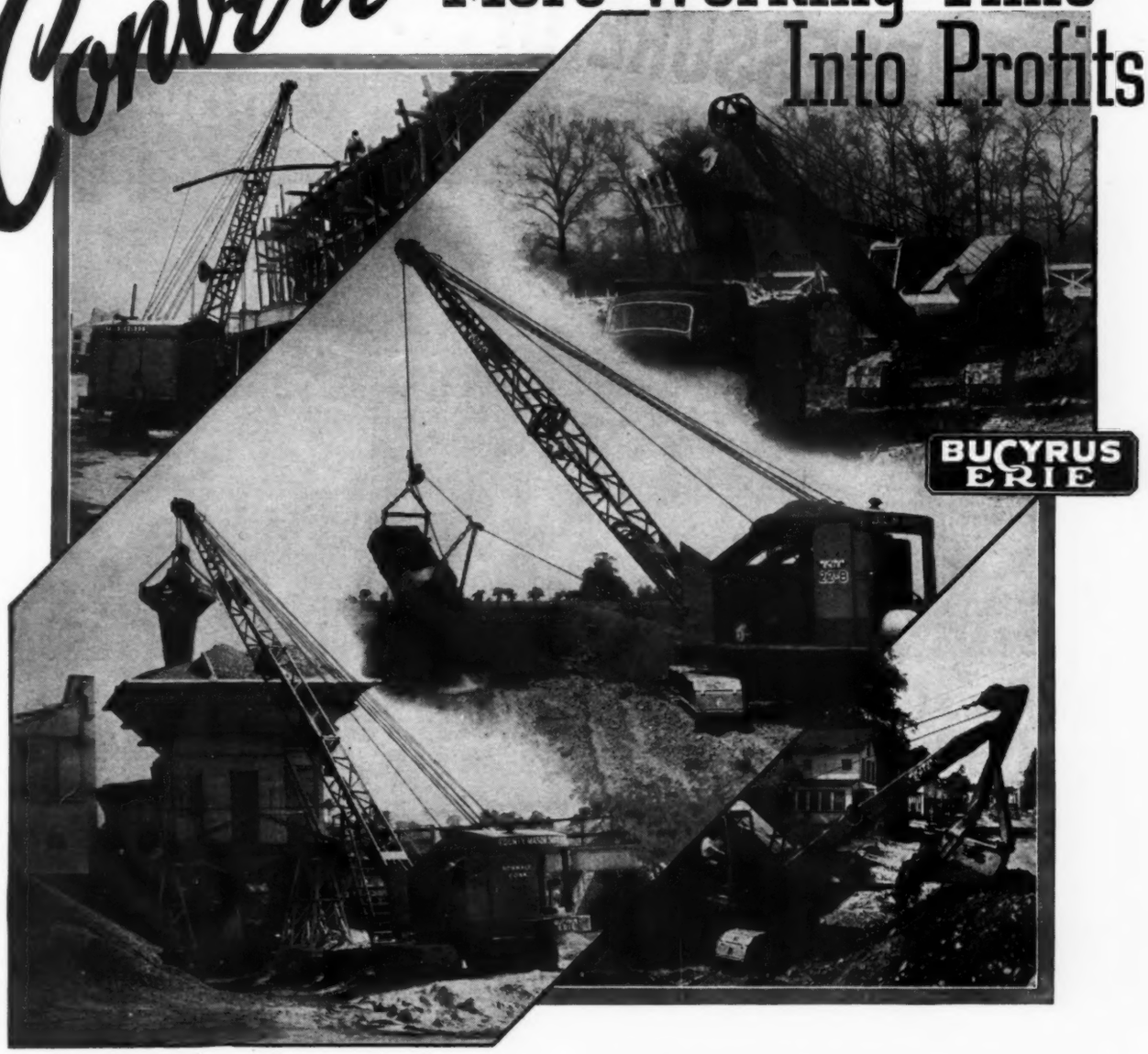


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ROADS AND STREETS

MARCH, 1948 • VOL. 91 • No. 3

# Ohio Experiments With Vibration

## in placement of screenings in macadam bases

**Remarkable speed and efficiency achieved in working screenings into stone, but data not obtained on relative density or stability compared with macadam constructed by traditional methods**

***By Charles W. Allen and S. O. Linzell***
Research Engineer and Assistant Research Engineer,
Ohio Department of Highways, Columbus

IN AN effort to improve the quality and efficiency of macadam base construction, the Ohio Department of Highways conducted tests with vibratory methods of placing screenings. Two manufacturers were interested in the development of machines utilizing the vibration principle. Each of these companies produced a machine early in 1947 using this principle but approaching the problem in a different manner.

The Buffalo Springfield Roller Company's approach was to combine vibration with rolling in one machine. The International Vibration Company believed in the application of vibration by a machine designed solely for that purpose.

The vibratory roller used, a product of the combined effort of the Buffalo Springfield Roller Company and the Pedershaab Machine Works of Denmark, was essentially an 8-ton tandem roller with a third roll of the same width but slightly smaller in diameter than the front and rear rolls, mounted between them. The front and rear rolls were both driving and steering rolls, while the third roll was an idler roll which was capable of being vibrated. The vibration was accomplished by an unbalanced shaft rotating at a high speed within this roll.

The vibrating roll could operate with free vertical movement following any irregularities in the pavement or could be locked so that its rolling surface was tangent to the front and rear rolls.

### The Vibrating Roller

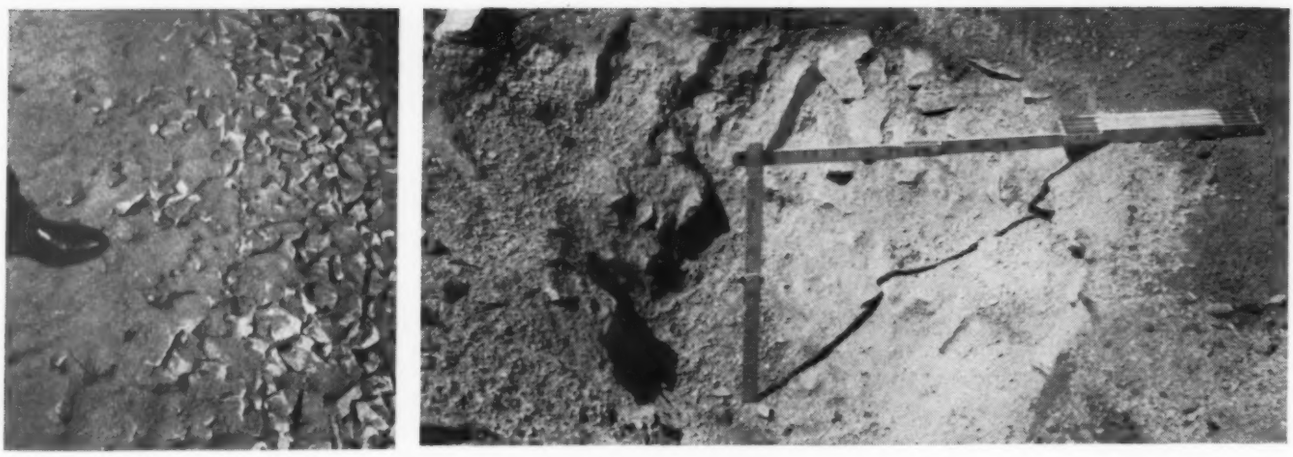
The general dimensions and specifications of this machine are:

| | |
|---|---|
| **Weight** | |
| Metal weight | 15,430 lb. |
| Full water ballast wt. | 17,650 lb. |
| **Rolls** | |
| Diam. of guide and drive rolls | 39.4 in. |
| Width of giude and drive rolls | 39.4 in. |
| Diameter of vibrating roll | 32.3 in. |
| Width of vibrating roll | 39.4 in. |
| Weight of vib. roll assembly | 2,000 lb. |
| Vibration frequency | 3,600 per min. |
| **Dimensions** | |
| Overall length | 160 in. |
| Overall width | 55.2 in. |
| **Transmission Speeds** | |
| 1st | 0.49 mph. |
| 2nd | 0.96 mph. |
| 3rd | 1.92 mph. |
| 4th | 3.98 mph. |

| **Compressions** | Pounds Per Linear Inch |
|---|---|
| Without ballast — with vibrator raised—guide and drive roll | 196 |
| With ballast—with vibrator raised—guide and drive roll | 224 |
| Without ballast — with vibrator locked tangent—all rolls | 129 |
| With ballast—with vibrator locked tangent—all rolls | 151 |

The International Vibration Company produced two machines, a pilot model and a later one eliminating many of the shortcomings of the original model. The basic design of both machines was similar. It consisted

★ Vibrating equipment devised by International Vibration Company (Vibro-Tamper)



★ (At left): Effect of vibration on a spread of screenings one inch thick. (Right): Ten-inch macadam course completely filled by one application of screenings and three of vibration

of a crawler propelled frame which moved a battery of six vibrating shoes over the base. Although each shoe received its power from the same source and was free to move up and down independently of the other shoes, each shoe had its own vibrating mechanism. Vibration on the pilot machine was accomplished by a rotating unbalanced shaft mounted on each shoe. On the second model vibration was accomplished by twin opposed unbalanced gears mounted on each shoe which eliminated the horizontal components of the vibratory forces which were largely dissipated through the frame of the original machine. The general dimensions and specifications of this machine are:

| | |
|---|---|
| Overall width | 12.6 ft. |
| Length of track on ground | 47 in. |
| Width of Crawler treads | 12 in. |
| Travel speed | 10 to 140 ft. per min. |
| Weight of machine | 6,400 lb. |
| Vibrator engine power | 30 hp. (at 2,000 rpm.) |
| Crawler engine power | 20 hp. (at 2,000 rpm.) |
| Number of vibrator shoes | 6 |
| Vibrator shoe dimensions | 20 x 25 in. |
| Surface contact area of each shoe | 306 sq. in. |
| Total weight of each vibrator shoe assembly | 180 lb. |
| Unbalanced weight of vibrator mechanism | 16 lb. |
| Vibration frequency | 2,800 per min. |
| Amplitude of vibration in suspension | 0.080 in. |

## Remarkable Efficiency

Tryouts with these machines on five projects in various parts of the state demonstrated remarkable efficiency in placing of screenings. Conventional practices required that screenings be placed after keying the coarse aggregate by six to eight repetitions of the spread and roll cycle on 4-in. course of macadam base. But by use of vibration, a course of equal thickness could be filled with from one to three spreads of screenings followed by an equal number of passes of the vibrating roller or vibrating shoe machine. One of these projects, a two-course drybound macadam base, was constructed with combinations of courses 4, 6, 8, and 10 in. thick. It was possible to completely dry fill the voids in a 10 in. compacted and keyed course with one application over 3 in. thick of dry screenings and three passes of the vibratory roller.

Two projects for the construction of considerable lengths of 8-in. thick waterbound macadam base consisting of two 4-in. courses were built in 1947 with the aid of the vibrating shoe machine. Both of these jobs were constructed according to conventional methods except for the placing of the screenings which were vibrated into place. Three spreads of screenings and three passes with the vibrator were all that were required to dry fill the 4-in. courses of coarse aggregate. The contractor expressed enthusiastic satisfaction regarding the performance of the machine. The coarse aggregate on all of these jobs was from 3½ to1½-in. size and screenings were ⅜-in to No. 100 mesh size. More complete dimensions of the machines and full details of the experimental projects are contained in a paper entitled "Use of Vibration in Placing Screenings in Macadam Bases" presented at the Twenty-Seventh Annual Meeting of the Highway Research Board.

Though the practicability and economy of placing screenings has been demonstrated, and the finished pavements are at least as smooth as those constructed by conventional methods, it has not been demonstrated that the pavements so constructed are more dense or more stable than macadam bases constructed by conventional methods.

★ Buffalo-Springfield-Pedershaab vibratory roller

•

Michigan's highway department has issued a map showing highways on which a 32,000-lb. tandem axle weight is permitted under a new state law.

## More Heavy Trucks on the Road

Production of motor trucks for the first eight months of 1947 was 48% ahead of 1946, notes "Highway Research Abstracts." The significant factor is the large increase in the number of heavy-duty trucks produced compared with 1946 and also 1940.

Largest factory sales gain for the year was in the 5-10,000-lb. gross class, up 178%. The 26,000 lb. or over class, up 117%; 16-19,500-lb. class, 105%; 19,500-26,000-lb., 97%; 14-16,-000-lb., up 79%.

Several reasons are advanced in trucking circles for the gradual shift from smaller to larger trucks. One reason is evident from factory sales figures. Foremost, perhaps, is the effect of labor costs. Today truck users see an advantage in hiring one driver for a big truck rather than two drivers for two trucks half the size.

Another boost for heavier trucks may lie in state trucking legislation. For example, a new N. Carolina law provides that 40,000-lb. gross vehicle weight loads can be hauled only by trucks of 300 cu. in. piston displacement or more. The reason is simple. Some truckers wanted more powerful units on the road to answer complaints that under-powered trucks were holding up long lines of traffic on hills. The law eliminates use in N. Carolina of light, popular-make trucks which are "souped-up" to handle big payloads. If the idea spreads to other states, sale of big trucks can expect another push forward.

## Hot Springs Harnessed for Ice Control

An unusual solution of a problem encountered on a relocation being made on an urban section of US 97 in the City of Klamath Falls, Oregon, is reported by state highway engineer R. H. Baldock. This is the proposed provision of hot water heating for a section of 4-lane concrete pavement about 400 ft. in length. The problem involved is the elimination of ice hazard on the approach grade to a railway undercrossing. Here, in order to meet the grade of a large irrigation canal, it is necessary to construct the pavement on an 8% grade.

Solution of this problem in the manner adopted is made possible by the presence, nearby, of a natural underground flow of water having a temperature ranging from 165° to more than 200° F. Heating of the pavement is to be accomplished by forced circulation of water from a well through ¾-in. pipes embedded at 18-in. intervals within the pavement slab. Pipes will be located at mid-depth in the pavement.

The water in the circulation system is not water from the underground flow, but is water heated by means of coils immersed in the underground flow. Circulation pumps are controlled thermostatically, being in operation at temperatures below freezing point and out of operation at higher temperatures. The pavement is divided into 30-ft. lengths, and individual heating grids are used in each length.

## 7-Mile Belt Conveyor System

A contract for building a belt conveyor system for transporting aggregate for the $58,000,000 Bull Shoals Dam in Arkansas has been awarded to Goodyear Tire & Rubber Co.'s mechanical goods division. The installation will be seven miles long and is said to be the longest ever constructed. Sixteen belt flights will comprise the cross-country transport system. Thirty-inch wide belts will be used for hauling a grand total of 4,000,000 tons of crushed stone and sand to the damsite. Each belt flight will be powered by a 100 hp. motor, and the system will be geared to move 525 ft. a minute, delivering 650 tons aggregate per hour. First half of the belt route is fairly level and the rest hilly, crossing several streams. The conveyor system will be erected on wooden bents, using native timber, varying in height above the ground from 4 to 20 ft. Two valleys will be spanned by means of 80-ft. long suspension bridges.

## Diversion of Highway User Funds Totals $2,317,471,000

1941 *Largest year;* 1946 *approaches* 1933 *level. Diversion statistics,* 1924 *through* 1946, *compiled in three tables by NHUC.*

Diversion of highway user funds to non-highway purposes by the states totalled $2,317,471,000 for the 23-year period 1924-1946, according to a compilation recently completed by the National Highway Users Conference. The largest diversion occurred in 1941 when over $215 million was used for non-highway purposes. Since that year, diversions have decreased so that 1946 diversions were reduced to the 1933 level. In recent years many states have completely abandoned the practice of diversion of highway user funds.

In view of postwar highway needs there have been demands that diverted funds be restored to the highway purposes for which they were originally levied.

"SEE YOU THERE!"

★ Quarry No. 2 blast on November 8, 1947

# Quarrying at Watauga Dam

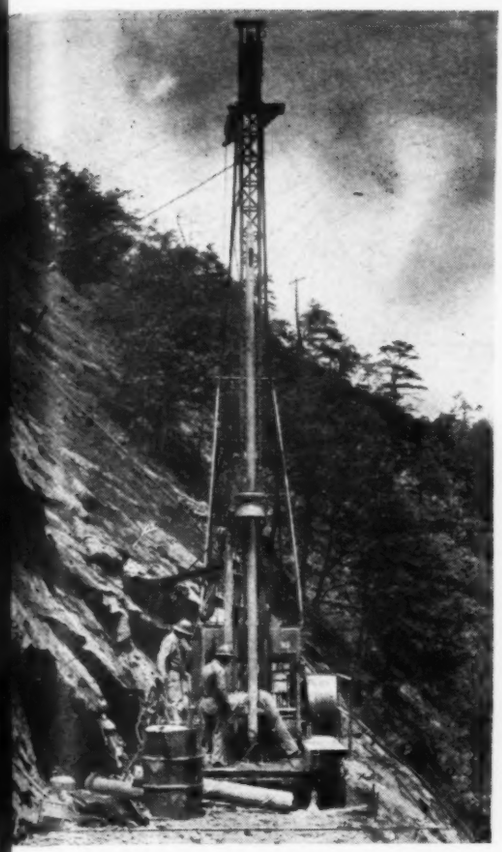
## DRILLING AND LOADING

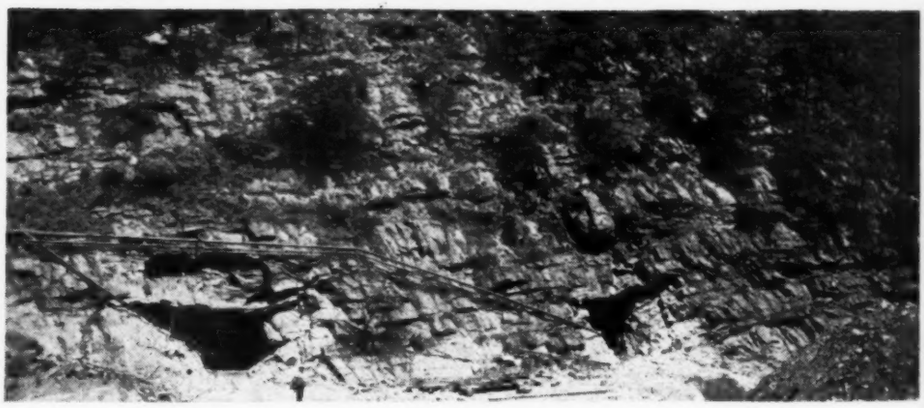
**By Oren Reed**
Construction Engineer,
Tennessee Valley Authority,
Watauga Dam, Elizabethton, Tennessee

★ Hauling Nitramon cans into Carden's Bluff coyote tunnel

THE main dam at Watauga is an earth and rock fill structure with a crest approximately 840 ft. long and a maximum height of nearly 325 ft. from lowest point in the foundation to the top at elevation 1998. The dam has a top width of 30 ft. and side slopes which average two horizontal to one vertical. It will contain about 1,500,000 cu. yd. of rolled earth fill, about 1,730,000 cu. yd. of quarry run rock, and 245,000 cu. yd. of crushed stone used as a filter between the earth and rock fills.

The main rock quarry is located in the steep mountain side on the left bank of the river immediately downstream from the toe of the dam. The quarry run rock required for the upstream and downstream portions





★ (Left): Well drill operations in Quarry No. 2. (Upper right): Hauling sandbags for stemming of coyote tunnel. (Lower right): Coyote tunnels in Carden's Bluff

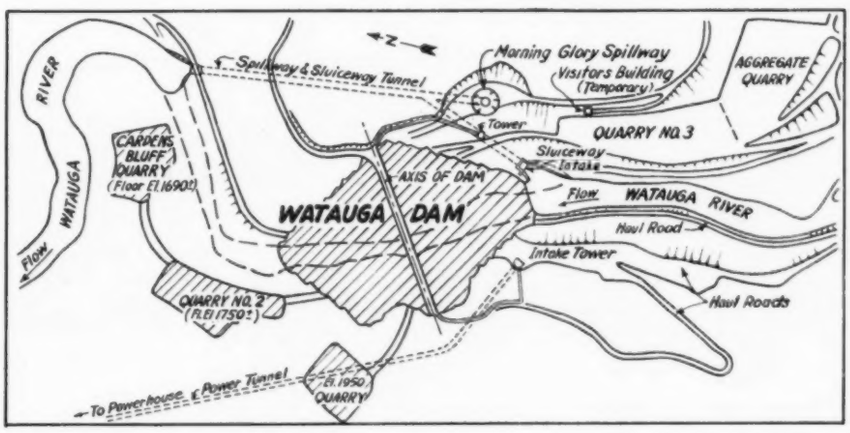
# DETAILS, WORLD'S LARGEST COYOTE BLAST

of the dam is being obtained from medium to coarse-grained, thin and medium-bedded, light gray, cross-bedded quartzite. It is divided by the bedding and jointing planes into ideally sized blocks for easy handling with power shovels after being loosened by explosives.

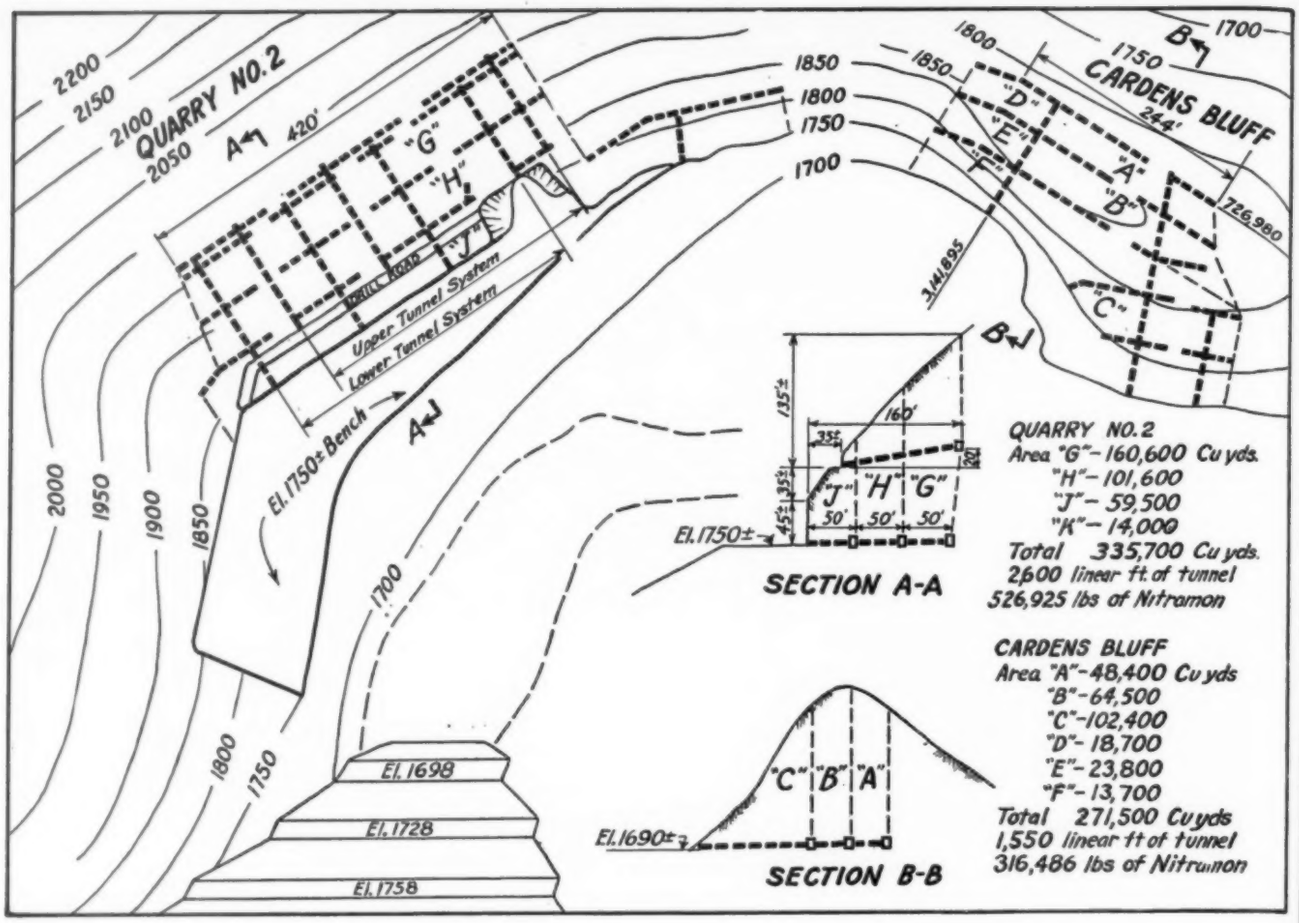
The quarry area was cleared and stripped during the winter and spring months of 1947 and drill benches and other preparatory work was started. The layout of the benches followed conventional methods where well drills were to be used for drilling blast holes. Hole spacing was on 20-ft. centers with 35-ft. burden. Benches were extremely difficult to drill and shoot because of the clean, smooth, 45-deg. slope of the mountain face.

## Very Difficult Drilling

During the initial operations on the drill roads with wagon drills, drifters, and stoppers which started April 2, 1947, it was found that the rock was exceedingly hard and abrasive. This was later confirmed in the well drill operations. Drilling progress was very slow, the average depth of hole drilled per bit dressing being less than 1.5 ft. The principal difficulty was the loss of gauge on the bit due to the abrasiveness of the quartzite. Factory representatives and metallurgists were consulted and many different methods for dressing and tempering the bits were tried without success. The first well drill started operation on May 14, 1947, and between July 11




★ Fig. 1. General plan rock quarries




★ Fig. 2. Coyote hole development for Quarry Run Rock

and Sept. 11, several small blasts were made on the elevation 1750 bench. These blasts were small and produced only a small yardage for use in the dam.

Due to the slow progress and the cost of the well drill operations, it was decided to drive a system of coyote blasting tunnels in Carden's Bluff which is located immediately downstream from the main quarry. These tunnels were started on July 14. The network of adits and cross-tunnels was 1550 ft. in total length (Fig. 2) with the tunnel invert elevation at about elevation 1690, about 15 ft. above the river level at the adits. Each tunnel was approximately 4 ft. wide by 6 ft. high, which was considered the minimum size for convenient driving; they were driven by conventional methods. Adits and cross-tunnels were spaced so that the explosion would not blow out into the river on the back side of the relatively narrow ridge nor throw too much material forward which would block haul roads and seriously delay the start of normal operations. The intent was to pick up the material and drop it back as nearly as possible into its original position. Cross-tunnels were located, in general, so that they would parallel the surface topography. The distance between cross-tunnels was approximately 50 ft., with a maximum

### Blast No. 1

1550 ft. of adits and cross-tunnels.
316,486 lb. explosives and primers.
Designed to yield 271,500 cu. yd. of solid rock, 400,000 cu. yd. loose; 600,000 cu. yd. actually produced, or 1.9 cu. yd. per lb. of explosives.

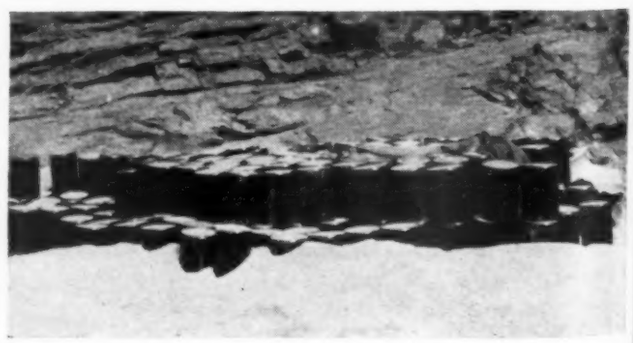
### Blast No. 2

2600 ft. of adits and cross-tunnels.
526,925 lb. of explosives and primers.
Designed for 335,700 cu. yd. solid rock minimum; 800,000 cu. yd. loose yield produced, or 1.5 cu. yd. per lb.

### Blast No. 3

2100 ft. adits and cross-tunnels; 600,000 cu. yd. loose yield expected.

★ Nitramon cans, 27.5-lb. units



★ Nitramon cans, 75-lb. units

## Charge Details for Quarry No. 2 (See Fig. 2)

| Pos. No. | Lbs. Change | No. and Size Cans (in.) |
|---|---|---|
| *(Adit No. 1)* | | |
| 1 | 3,970 | *85—7½ (3) |
| 2 | 6,990 | 252—5½ (3) |
| 3 | 6,970 | 252—5½ |
| 4 | 5,012 | 144—5½ |
| | | *22—7½ |
| 5 | 6,990 | 144—5½ |
| | | *65—7½ |
| 6 | 6,970 | 252—5½ |
| 7 | 6,970 | 252—5½ |
| 8 | 8,950 | 324—5½ |
| 9 | 8,059 | 243—6 |
| 10 | 7,036 | 212—6 |
| 11 | 7,003 | 211—6 |
| 12 | 6,046 | 182—6 |
| 13 | 6,046 | 182—6 |
| 14 | 8,037 | 174—6 |
| | | 82—5½ |
| 15 | 8,950 | 324—5½ |
| 16 | 9,940 | 360—5½ |
| *(Adit No. 2)* | | |
| 1 | 3,010 | 108—5½ |
| 2 | 3,010 | 108—5½ |
| 3 | 2,515 | 90—5½ |
| 4 | 2,515 | 90—5½ |
| 5 | 3,010 | 108—5½ |
| 6 | 2,020 | 72—5½ |
| 7 | 4,000 | 144—5½ |
| 8 | 7,960 | 288—5½ |
| 9 | 6,970 | 252—5½ |
| 10 | 6,970 | 252—5½ |
| 11 | 7,960 | 288—5½ |
| 12 | 10,930 | 396—5½ |
| 13 | 10,930 | 396—5½ |
| *(Adit No. 3)* | | |
| 1 | 7,960 | 288—5½ |
| 2 | 4,000 | 144—5½ |
| 3 | 3,010 | 108—5½ |
| 4 | 2,020 | 72—5½ |
| 5 | 4,000 | 144—5½ |
| 6 | 5,980 | 216—5½ |
| 7 | 4,990 | 180—5½ |
| 8 | 4,990 | 180—5½ |
| 9 | 4,990 | 180—5½ |
| 10 | 4,990 | 180—5½ |
| 11 | 5,980 | 216—5½ |
| 12 | 7,960 | 288—5½ |
| 13 | 5,980 | 216—5½ |
| 14 | 5,980 | 216—5½ |
| 15 | 5,980 | 216—5½ |
| 16 | 6,970 | 252—5½ |
| *(Adit No. 4)* | | |
| 1 | 5,980 | 216—5½ |
| 2 | 5,980 | 216—5½ |
| 3 | 4,990 | 180—5½ |
| 4 | 4,000 | 144—5½ |
| 5 | 4,000 | 144—5½ |
| 6 | 9,940 | 360—5½ |
| 7 | 5,980 | 216—5½ |
| 8 | 4,990 | 180—5½ |
| 9 | 4,990 | 180—5½ |
| 10 | 6,970 | 252—5½ |
| 11 | 9,940 | 360—5½ |
| 12 | 7,960 | 288—5½ |
| 13 | 7,960 | 288—5½ |
| 14 | 7,960 | 288—5½ |
| 15 | 7,960 | 288—5½ |

| Pos. No. | Lbs. Change | No. and Size Cans (in.) |
|---|---|---|
| *(Adit No. 5)* | | |
| 1 | 5,120 | *110—7½ (3) |
| 2 | 1,578 | *33—7½ (3) |
| 3 | 1,578 | *33—7½ (3) |
| 4 | 1,578 | *33—7½ (3) |
| 5 | 1,578 | *33—7½ (3) |
| 6 | 1,900 | *72—5½ (5) |
| 7 | 1,925 | *73—5½ (5) |
| 8 | 1,905 | *73—5½ (4) |
| 9 | 2,068 | *28—7½ |
| | | *28—5½ (4) |
| 10 | 3,096 | *66—7½ (3) |
| *(Adit "A")* | | |
| 1 | 6,970 | 252—5½ |
| 2 | 5,980 | 216—5½ |
| 3 | 5,980 | 216—5½ |
| 4 | 5,980 | 216—5½ |
| 5 | 6,970 | 252—5½ |
| 6 | 9,940 | 360—5½ |
| *(Adit "B")* | | |
| 1 | 6,970 | 252—5½ |
| 2 | 4,990 | 180—5½ |
| 3 | 4,990 | 180—5½ |
| 4 | 6,475 | 234—5½ |
| 5 | 6,475 | 234—5½ |
| 6 | 6,475 | 234—5½ |
| 7 | 6,475 | 234—5½ |
| 8 | 6,970 | 252—5½ |
| *(Adit "C")* | | |
| 1 | 9,960 | **360—5½ (3) |
| 2 | 6,970 | 252—5½ |
| 3 | 5,980 | 216—5½ |
| 4 | 5,980 | 216—5½ |
| 5 | 5,980 | 216—5½ |
| 6 | 6,970 | 252—5½ |

*Indicates Nitramon No. 2. All other charges Nitramon "A".

Numeral in parenthesis indicates number of 5"x24" primers. Two primers used unless thus indicated.

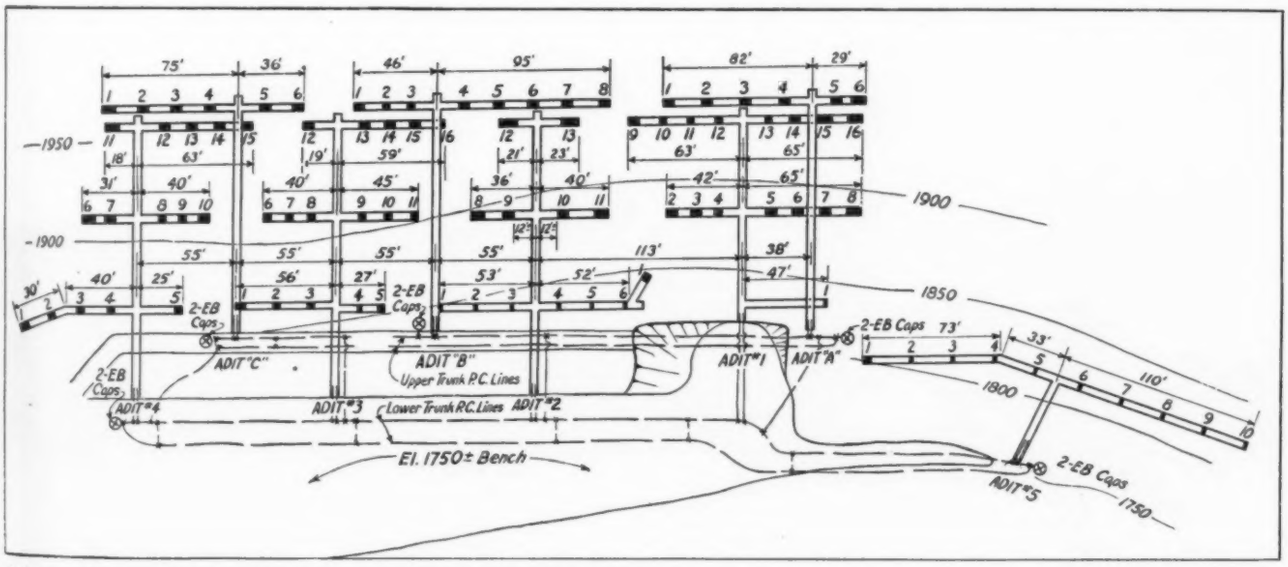
## Recapitulation

| | Cans of Explosives | | | | | Total | |
|---|---|---|---|---|---|---|---|
| | 5½"x24" No. 2 | 5½"x24" "A" | 6"x24" "A" | 7½"x24" No. 2 | 5"x24" Primer | Cans | Lb. |
| Adit No. 1 | ... | 2,386 | 1,204 | 172 | 34 | 3,796 | 113,939 |
| Adit No. 2 | ... | 2,592 | .... | ... | 26 | 2,618 | 71,800 |
| Adit No. 3 | ... | 3,096 | .... | ... | 32 | 3,128 | 85,780 |
| Adit No. 4 | ... | 3,600 | .... | ... | 30 | 3,630 | 99,600 |
| Adit No. 5 | 246 | .... | .... | 336 | 36 | 618 | 22,326 |
| Adit "A" | ... | 1,512 | .... | ... | 12 | 1,524 | 41,820 |
| Adit "B" | ... | 1,800 | .... | ... | 16 | 1,816 | 49,820 |
| Adit "C" | ... | 1,512 | .... | ... | 13 | 1,525 | 41,840 |
| Total | 246 | 16,498 | 1,204 | 508 | 199 | 18,655 | 526,925 |

of about 60 ft. The explosives company representatives recommended that the cover over the explosive charge be not more than about 100 ft. This recommendation was exceeded slightly but was the criterion used in fixing the general quarry floor grade. The movement of muck in a cross-tunnel to the adit was largely a hand job and it was found that a closer spacing of the adits with a corresponding shortening of the cross-tunnels resulted in a saving in time and expense. The driving of the coyote tunnels was completed on Sept. 8. Loading required a week and was completed on Sept. 10.

### The Loading Plan

Dupont Nitramon, which was used in all major quarry blasts, is a special safety blasting agent. It is powerful but insensitive and cannot be detonated by fire, friction, lightning, or any ordinary shock. Detonation requires a Nitramon primer and, in quarry blasting, a Primacord detonating fuse. While these materials are classed as explosives and must be handled as such, they, too, are relatively insensitive. From a practical standpoint no hazard whatever is introduced in preparing for a Nitramon blast until the last stage of




☆Fig. 3. Nitramon Loading Plan Quarry No. 2—Coyote Hole Development.

★ Downstream view of broken rock from Quarry No. 2 blast

★ Nitramon cans stacked in coyote tunnel

the work when the fuse is primed with an electric blasting cap just before the shot is fired. The combination of Nitramon and Primacord, when used together under proper supervision, thus provides maximum safety in quarry operations. This safety factor is very important when the loading time extends by necessity over a period of a week or 10 days and is started in one adit while drilling is going on in an adjoining adit.

The total charge of explosive, including Nitramon and primers, was 316,486 lb. Nitramon was delivered in tin cans which are 2 ft. in length and of varying diameter. These cans were loaded on a small car which was pushed into the tunnel on a narrow gauge track. They were then stacked in piles in the cross-tunnels only, more or less like cordwood, as indicated by Fig. 3 and in one of the photos. Each pile was roughly retained by sand bags, although the spaces between the piles were not stemmed. The amount of Nitramon in any tunnel was computed for and varied with the tonnage of rock above the tunnel, taking into account also the physical and geologic features of the rock. After the Nitramon had been placed, each adit was tightly stemmed with sand, which was moved into place by an air-hoist operated scraper. The loose sand stemming was finally faced off at the portal by sand bags.

## Explosive and Primer Used for Carden's Bluff Blast

| | Cans of Explosive | | | | | 40% | Total | |
|---|---|---|---|---|---|---|---|---|
| | 11"x16" "A" | 6"x24" "A" | 5½"x24" "A" | 5"x24" "A" | 5"x24" Primer | Special Load | Cans | Lb. |
| Adit No. 1 | 307 | ... | .... | .... | 13 | .... | 320 | 23,285 |
| Adit No. 2 | ... | 812 | 500 | 3,077 | 50 | .... | 4,439 | 112,561 |
| Adit No. 3 | 259 | ... | 5,762 | .... | 68 | .... | 6,089 | 179,240 |
| W.D. holes | ... | ... | .... | .... | ... | 1,400 | .... | 1,400 |
| Total | 566 | 812 | 6,262 | 3,077 | 131 | 1,400 | 10,848 | 316,486 |

## New Record Set

The firing lines were run to the water filtration area, an air-line distance of 2,000 ft., and the Carden's Bluff blast was set off at 12 noon, Sept. 11. The results were entirely satisfactory. The blast was designed to yield 271,500 cu. yd. of solid rock which with swell would equal about 400,000 cu. yd. of loose rock. Due to the overbreakage about 600,000 cu. yd. of loose rock were produced. It was said to have been the largest coyote blast as of that date. The rock was thin-bedded and the jointing was well defined. The joints were stained by weathering but the rock itself was firm and of good quality. There was a small amount of overburden on the back slope of the ridge but the rock, in general, was clean. The breakage was very good and secondary blasting was negligible. Results were so good that the use of the well drills in the quartzite was abandoned and tunneling for the second coyote hole development in the downstream portion of the main quarry face (Quarry No. 2) was pushed. The well drills were shifted to an upstream dolomite quarry, where previous drilling had indicated that they could make good progress.

Preparation for the second coyote hole blast in quarry No. 2 followed the general methods used for the Carden's Bluff blast with only a few changes. The general development plan and sections are shown by Fig. 2. Due to the height of the face, adits and cross-tunnels were at two levels, the lower system being at elevation 1750, which was originally laid out for the floor of the quarry, and

(*Continued on page* 90)

★ (Left): Pressweld gun filling tunnel adit of Quarry No. 2. (Right): Sand scraper for blocking of tunnel adit

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# EDITORIAL

## ★ Better Sampling Rigs Needed

Engineers, contractors and equipment makers should get together to develop better apparatus for the under-surface exploration needed today on road work. This point was brought out at the Highway Research Board meeting last December, where a committee discussion dwelt briefly on the problem. One spokesman pointed out that little or no standard equipment available today is exactly what soils engineers want for driving or boring test holes.

The drilling equipment which is manufactured for core drilling work is designed for ledge drilling and not for overburden. The core drilling companies do about 90% of their work in ledge rock and 10% in overburden, whereas a highway department does 90% of its work in overburden and only 10% in ledge rock. The basis for the sampling and design of equipment in overburden is materially different from that for rock core drilling.

Specifically the need is for equipment for deep borings, for determination of the character of soil down to bed rock, and for shallow borings in connection with compaction control, and for checks on material depth in base and other layers involved in reconstruction. Heavy-duty special equipment of the type designed by O. J. Porter [R&S, Nov. '47] is proving of great advantage in the saving of time, money and manpower on large projects and is also adaptable to highway work. It is hoped that lighter mobile units will come along in the near future for ordinary highway work. Such equipment as we do see today is often adapted from quarry or clay-pit machines or is improvised by the highway departments.

Part of the current personnel shortage is the lack of young field men. Proper power equipment for soils and foundation exploration and test could certainly save a great deal of time and manpower, and insure more systematic and thorough development of under-surface information.

## ★ Maintenance: Dangerous Occupation

Recently on our editorial page, we said something about a New Year's resolution to improve shoulder maintenance.

Resolutions should not be confined to the new year, and we can think of another one to make this spring, namely, to look out for the safety of construction and road maintenance employees.

Few people realize how essentially hazardous highway work is. A typical example of the seriousness of the problem is shown by figures published recently in Missouri. Missouri highway department employees incurred 475 injuries in 1947, an increase of 20% over the previous year. Fortunately, most of the accidents were minor, only about 38% losing more than 3 days off duty. In 49% of the cases no time was lost, the employee returning to work the following day. It is a credit to the department's vigilance that no fatal injury occurred during the year. Most of the accidents involved the maintenance workers, but 49 injuries were reported by construction personnel, and 26 by equipment men. Special significance is seen in the fact that 79 of the accidents occurred to employees who had a previous record of accident or injury.

One hundred fifty-three of these accidents involved highway department equipment.

Forgetting for a moment the humanitarian side, it is good dollar-and-cents business for everybody to step up vigilance and keep the men safety-conscious. The Missouri injuries resulted in 6700 man-days off duty; also loss of wages over and above compensation amounting to many thousands of dollars for employees, to say nothing of the slowing up of vital work to the highway department.

All these figures are not published to criticize Missouri, whose record is better than those of some states. Our purpose is simply to issue a fresh reminder at the start of the construction and maintenance season.

Do you have a real safety program? Are you working it?

## ★ Motor Industry Eying Safety Problem

Highway and traffic department leaders will be glad to hear that a committee in the automotive industry is active on the problem of how that industry can help reduce accidents.

Automobile people recently were challenged by Paul Hoffman, who is president of Studebaker and chairman of the Automotive Safety Foundation. Mr. Hoffman in addressing the National Automobile Dealers' Association in Chicago not long ago said, "Unless every section of the automotive industry takes immediate steps to solve urban traffic problems and restores safe pleasant travel on the nation's highways, automobile manufacturers and dealers are faced with markets that will shrink and possibly dry up." Declaring that the promotion of highway safety is more than mere humanitarianism, Mr. Hoffman continued. "It would be folly to blind ourselves to the serious implications of the mounting flood of traffic."

While thoughts of this kind are directed at the training of drivers, the effort is of interest to roadbuilders because it represents one more link forged in the chain of united effort that is necessary to eventually reduce accidents on our streets and highways.

# ★ When Is a Bid Too Low?

The other day a contractor bid 17c per cu. yd. for excavation on an airport in Alabama. As one of 14 bidders he was lowest only by a narrow margin, three other bidders going below 20c with eight under 24c.

In other states, reports are drifting in that earth-moving prices are somewhat lower and in some cases contractors are commencing to wonder just where this tendency will end up. This subject was thrashed out at the Associated General Contractors' meeting at Dallas last month, and one Texas contractor tried to talk a bit of sense by reminding fellow contractors that there is no use trying to "use the force of gravity" in bidding just to get a job.

The state highway departments and other public agencies in this enlightened age realize that the contractor must make a profit, and that everybody loses when a contractor goes broke. Road officials in the most progressive states are planning harder than ever to lay out projects on a long-range, uniform basis—sometimes working closely with contractors and suppliers—so that contractors in turn can organize their outfits and gauge their costs and bids on a continuing basis. In one or two states this past year bidders sharpened their pencils, apparently with the feeling that this might be the last job for a while because road funds were running low. In other states the road outlook is spotty for other reasons, including lack of sufficient engineering personnel, lack of leadership in the highway departments and lack of a program to analyze the need for more highway funds and sell the legislature.

This is a free country and contractors have the privilege of committing business suicide if they wish. But both highway departments and contractor organizations ought to devote fresh attention to the art of preparing bids and keeping costs. When bids go below common sense level, the letting agency should regard this fact as a danger signal rather than an achievement of management.

# ★ Contractor-Engineer Cooperation

How to get needed road improvements and repairs done in the face of the tight contracting situation is a problem almost everywhere these days. The problem was given recognition at the recent ARBA conference in Washington. Commissioner MacDonald used this occasion to urge that highway departments meet with local contractors and equipment suppliers to work out "the best possible program that will utilize the field highway construction plant" without pushing bid prices higher.

One way *not* to answer contractor reluctance is for a state, county or city body to willy nilly set up a greatly expanded construction or heavy repair operation of its own. On the other hand, a highway department's first duty is toward the taxpayers and not to a contractor group. The wise policy is not always easy to discern.

This outburst of thought was inspired by recent statements made in Missouri. The *Mid-West Contractor*, in an editorial last November, announced that "with a capital outlay of $225,000 the Missouri highway department has decided to go into the highway building business." We quote the editorial further: "Declaring that many small jobs advertised have failed to receive any bids, a high official has stated that the state has decided to build a few roads and bridges on their own."

The editorial made a good general point when it suggested that small unattractive projects might attract bids if bunched into single offerings. This has often enabled a contractor to work on several jobs at the same time or in logical sequence, with resulting economy.

Occasion for the editorial was the decision of the Missouri highway commission last October to have the highway department investigate the possibilities of securing additional equipment. This was a natural result of citizen demands for speedy, economical delivery or road improvements in many sections. The investigation was made, according to chief engineer C. W. Brown, but because of uncertain equipment deliveries, nothing was decided.

In discussing this situation, Mr.

(*Continued on page* 91)

## Equipment Used by Average County and State Highway Maintenance Department per 1000* Miles of Highway

**Based on Public Roads Administration data as supplied by J. S. Bright, deputy commissioner, in paper before recent ARBA Road Conference**

| Type of Equipment | County No. Units | County Est. Cost New | State No. Units | State Est. Cost New |
|---|---|---|---|---|
| Automobiles (½-ton pickup truck) | 5 | $ 8,000 | 19 | $ 30,400 |
| Air compressors | 2 | 10,000 | 3 | 15,000 |
| Grader, motor | 7 | 56,000 | 12 | 96,000 |
| Grader, tow | 2 | 6,000 | 10 | 30,000 |
| Loader | 1 | 2,500 | 3 | 7,500 |
| Maintainer | 2 | 2,000 | 1 | 1,000 |
| Mixer | 2 | 3,600 | 4 | 7,200 |
| Mower | 3 | 4,500 | 9 | 13,500 |
| Plant—Crushing | 1 | 15,000 | 1 | 15,000 |
| Plows—Snow (displacement types) | 10** | 10,000 | 45** | 45,000 |
| Rollers | 2 | 10,000 | 6 | 30,000 |
| Shovels—Power (cranes, etc.) | 1 | 13,000 | 2 | 26,000 |
| Tractor—Crawler and wheel | 5 | 27,500 | 10 | 55,000 |
| Trucks—1½-2 ton | 22 | 44,000 | 16 | 32,000 |
| Trucks—Over 2 ton | 5 | 20,500 | 44 | 198,000 |
| Trailer | 2 | 5,000 | 3 | 7,500 |
| Welding machine | 1 | 2,600 | 1 | 2,600 |
| Subtotal | 73 | | 189 | |
| Other major and unclassified equipment | 9 | 13,250 | 51 | 56,750 |
| Total | 82 | $253,450 | 240 | $668,450 |
| Total maintenance expend. (average) | | $197,000 | | $665,000 |
| Ratio of equipment cost new to expend. | | $1.28 | | $1.02 |

Average state maintains 11,320 miles of highways; average county, 1,100 miles.

| Surface Types | County Miles | County Percent | State Miles | State Percent |
|---|---|---|---|---|
| 1. Unimproved (nonsurfaced) | 570 | 57 | 170 | 17 |
| 2. Soil-aggregate (gravel or equivalent) | 350 | 35 | 250 | 25 |
| 3. Low-type bituminous or better | 80 | 8 | 580 | 58 |
| Total | 1,000 | 100 | 1,000 | 100 |

*Mileage unit consists of highways with surface types for each political subdivision as shown in lower part of table.
**Northern areas.

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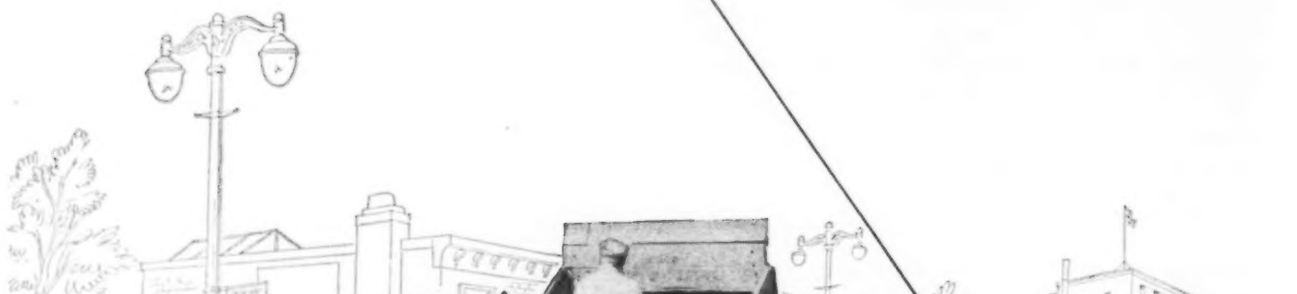


*Matchless Advantages*

**Built into the B-G Tamping-Leveling Finisher are advantages that combine to assure superior performance on the widest variety of bituminous paving jobs. For instance . . .**

**The B-G Finisher *tamps, levels* and *"strikes off"* simultaneously — automatically measures the correct amount of compacted material for the depressions — leaves a level surface that is maintained under rolling and traffic. The B-G Finisher *automatically* adjusts to differences in the sub-grade and lays to the established grade.**

**There are other important advantages. For the whole story of B-G Finisher performance, see your Barber-Greene distributor.**

***Positive Traction***

***Crawlers have the traction to push loaded trucks up grades while unloading . . . plus adequate control of steering necessary on any job.***

***Large Hopper***

***Five-ton hopper saves delays, allows Finisher to operate between truck loads.***

***Dual Controls***

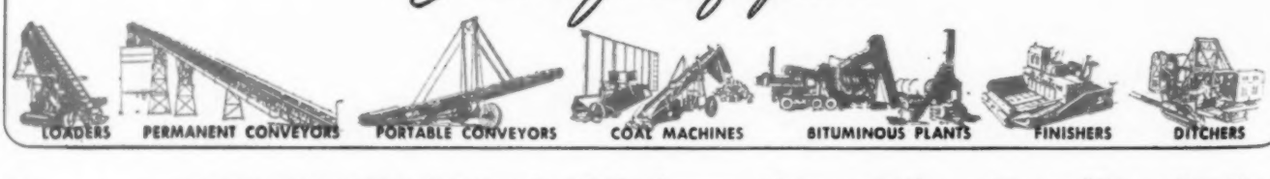
***The B-G Finisher may be operated from either side — for easier control while matching previous mat.***

***Wide-Range Utility***

***For all bituminous jobs — from sheet asphalt to stabilized mixes — the B-G Finisher is economical, efficient and adds to the quality of the road.***

BARBER · GREENE COMPANY, AURORA, ILLINOIS

*Constant flow Equipment*



# With the AGC at Dallas

A RIP-SNORTIN' Texas "norther" greeted contractors gathering for the 29th annual convention of the Associated General Contractors of America, Inc., held at Dallas Feb. 9-12. Contractors, being traditionally a hardy, ruddy-faced breed, credited their program interest rather than fear of the weather for the jammed indoor attendance. At any rate, over 600 delegates were in the room to greet retiring president F. W. Parrott on the opening morning and a record 1400 registered for the entire convention.

- **1400 contractors and visitors attended "biggest ever" convention of Associated General Contractors**
- **Cooperative work of AASHO-AGC national joint committee to be supplemented by establishment of state-wide contractor-engineer committees**

### AGC Membership Doubled Cooperative Effort Widened

Membership in AGC has passed the 4500 mark, or nearly double that of 1939, reported managing director H. E. Foreman in his annual report. In reviewing the group's many activities he discussed AGC's growing cooperative effort with other organizations. In addition to the Joint Committee with AASHO, similar committees have been formed with state aviation officials and with the Associated Equipment Distributors. The AGC is also considering working with other organizations on industry, labor and public relations; has undertaken joint work with the American Institute of Architects on standard bidding procedures and specifications; is continuing its work with pump and mixer makers on standardization; has helped support the work of the Highway Research Board, and is now helping support a building research advisory board of the National Research Council; is expanding chapter cooperation with local groups.

### Retarding Factors

Discussing the factors retarding the construction industry, Charles H. Sells, director of public works of New York state, complimented machinery producers and distributors for generally good efforts to hold equipment prices in line. He took labor to task for continued restrictions, the short work-week and general decrease in productivity despite wage advances, while reminding that there is no quarrel over the principle of good pay. Restrictive labor regulations should be reviewed to permit greater freedom of individual effort, he said. The supply of qualified workers is dwindling in many areas, warned Mr. Sells, and will soon be too small to meet the piled-up backlog of projects.

Mr. Sells also used velvet gloves to hand a few socks to contractors for attitudes sometimes observed, such as holding back on bidding for tax reasons, using undesirable expedient solutions and "counter-acting" practices. He also scored public officials who are slow to release accumulated funds for needed construction.

Progress of AGC chapters in sponsoring construction battalion units under Corps of Engineers cooperation was told by President Parrott. In establishing sixty-three "Army Affiliated Units" to date in the national preparedness program, the construction industry through the AGC has stepped far ahead of other basic industries having similar programs.

Another example of growing interorganization harmony in the road building and construction industry was seen in the appearance at Dallas of Tom Calloway, president of the American Road Builders' Association. Mr. Calloway traced the opportunity for AGC and ARBA to work in common for industry progress. He invited AGC members to visit the Road Show in Chicago next July—a show which he characterized as an Industry Exposition and not merely an ARBA affair.

### Dispute Plan Announced

Making national headlines was the news revealed at the AGC meeting of a concrete plan by the AF of L for settlement of jurisdictional disputes in the building and construction industry. Richard J. Gray, the federation's building and construction trades chief, outlined the plan which would provide that all such disputes not settled locally within ten days be referred to a 5-man board in Washington. Gray termed the plan "the first fully comprehensive and thoroughly implemented charter for self-government, dealing with specific problems in industrial relations, in any basic industry."

### High Accident Record

G. O. Griffin, of Dravo Corp., Pittsburgh, chairman of AGC's accident prevention committee, reported on what he termed the disappointing safety record of the construction industry. Quoting from published statistics he noted that the industry ranked 32nd in accident frequency and 37th in accident severity among 48 major industries in 1946. This compared with 29th and 36th respectively last year.

Confessing inability to understand the lack of interest among contractors in accident prevention, Mr. Griffin pointed to the dollar-saving value of

★ New AGC Officers for 1948—Adolph Teichert, Jr., Sacramento, Calif., Vice President; Dwight W. Winkelman, Syracuse, N. Y., President; H. E. Foreman, Washington, D. C., Managing Director; William Muirhead, Durham, N. C., Secretary-Treasurer.

★ Carl B. Jansen, Pittsburgh, 1947 Chairman AGC labor relations Committee; Richard J. Gray, president, building and construction trades department, American Federation of Labor; James D. Marshall, AGC's assistant managing director; Robert N. Denham, general counsel, National Labor Relations Board.

such work, and recalled that AGC a year ago passed a resolution to supplement the safety effort of insurance companies and the National Research Council. In the interim the "AGC Manual of Accident Prevention in Construction" has been undergoing extensive revision.

Among other accident prevention activities, AGC's committee has surveyed the availability of safety films and slides, finding little material available. Safety experts have been called to AGC headquarters for advice in enlarging accident prevention activities, and members have been questionnaired on types of activity to be undertaken. A partial list of qualified safety engineers has been compiled, in the belief that there should be more expenditure by insurance companies and others on safety inspection.

### Safety Winners

The AGC's annual accident prevention contest was entered by 116 construction companies, with the following winners for the year ending Sept. 30, 1947:

**Highway Division,** above-average man-hours exposure: (1st Place) The O'Neil Construction Co., Havre, Mont.; (2nd) Robert W. Cleveland & Co., East Orange, N. J.; (3rd) Burrell Const. & Supply Co., New Kensington, Pa.

Below-average man-hours exposure: (1st) George K. Werner & Son, Clay Center, Nebr.; (2nd) The Bellefontaine Development Co., Bellefontaine, Ohio; (3rd) Thorpe Const. Co., Akron, Ohio.

**Heavy Division,** Above-average man-hours: (1st) The Fluor Corp., Ltd., Los Angeles, Calif.; (2nd) Maxon Construction Co., Inc., Dayton, Ohio; (3rd) The Holmes Construction Co., Wooster, Ohio.

**Below-average** man-hours: (1st) W. L. Johnson Const. Co., Hicksville & Columbus, Ohio; (2nd) Ferry Const. Co., Atlantic City, N. J.; (3rd) C. Y. Thomason Co., Greenwood, S. C.

**New England Division,** (1st) E. J. Cross Company, Worcester, Mass.; (2nd) H. P. Cummings Const. Co., Ware, Mass.; (3rd) Vappi Co., Inc., Cambridge, Mass.

### Highway Session Notes

The highway division of AGC under chairmanship of 1947 president Gayle Armstrong, devoted a considerable part of an all-morning session to pending federal highway legislation. Highlight of the session was the endorsement of the principles of H B 4867 which would extend the federal-aid program essentially as now set up under the Federal Highway Act of 1944 (see this issue of ROADS AND STREETS for a summary of recent legislative developments in Washington).

In urging AGC to back this bill, chairman Armstrong warned "if we don't have this program, we won't have any," and urged contractors to make their views known at once to their congressmen and senators.

D. C. Greer, state highway engineer of Texas and a member of the AASHO's legislative committee, discussed details of pending bills in Washington. He reminded that currently all states are receiving federal-aid under a 1-year extension of the original 3-year law. New federal funds would be available beginning July, 1949. The PRA has ruled that state road contracts anticipating such funds can be let as early as January, 1949. He pointed to the utmost importance of the early passage of H B 4867 which will enable highway departments to plan their programs without interruption. Mr. Greer observed that Texas is among the states which have used up federal allotments in full stride and which will have to curtail lettings if any serious delay on the new funds occurs.

Not all states have kept up with their federal-aid highway programs, said Mr. Greer, who urged contractors in lagging states to take constructive action toward stimulating public and official interest. Highway leadership in some states is falling on contractors' shoulders.

Several AGC spokesmen again dwelt at length on the very serious problem of low highway department salaries and consequent lack of personnel to get out plans and handle projects. In nearly all states, civil engineering college enrollments are dwindling. Various proposals were made for sending missionaries into the high schools to interest young men in an engineering career. The value of aggressive contacts, and especially of inducing engineering students to spend their summers on road projects, was conceded. But all present underscored the basic need to improve the civil engineer's salary outlook.

### More Road Contractors

The growing numerical strength of highway contractors was revealed by a membership survey by AGC. Of 4200 members at the time canvassed, 2100 said they perform highway work to some extent, as against 2700 who do building and 1700 "heavy" construction.

Federal-aid highway contract work performed in 1947 totaled $650 million, reported A. C. Clark of Washington, D. C., chief of PRA's construction division. Since the war 858 new contractors have undertaken federal-aid work, 112 have become reactive, and 250 new firms have bid but won no awards—1222 newcomers in all. Some 4745 federal-aid road projects were completed last year totaling over 200,000 miles, of which only 0.8% were by force account.

### $135,000 Average Job

Continuing statistically, Mr. Clark noted that contracts involving federal aid ranged from $177.50 for a culvert to $4,605,885 for the Memphis bridge superstructure, the average being $135,000, 2% of projects were under $25,000, 4% in the $25-50,000 range, 10% in the $50-100,000, 28% in $100-250,000, 26% in $250-500,000, 19% in the $500-1,000,000, and 11% over $1,000,000.

Bids tendered averaged 3.8 per project for the year, New York being low with 1.2 and Georgia high with 8.2. Individual projects ranged from "no bids" on 238 jobs, to as high as 25 or more bidders in a few cases.

Prices for 1947 work averaged 90% over 1940, rising to 98% in the last quarter. Quarterly averages were 9.0, 12.3, 16.3 and 19.4% up over the

★ (Below): Seen at the Joint Cooperative Committee meeting, American Association of State Highway Officials and The Associated General Contractors of America—Charles H. Sells, superintendent, department of public works, N. Y.; James J. Corbett, construction engineer, Missouri; Gayle Armstrong, 1947 Chairman AGC Highway Contractors Division, Roswell, N. Mex.; D. C. Greer, state highway engineer, Texas; Thomas H. Joyce, Jr.; committee member, Springfield, Ill.; Morris E. DeWitt, co-chairman of committee, Poplar Bluff, Mo.; A. C. Clark, chief, construction division, PRA; J. A. Elliott, division engineer, PRA, Fort Worth; C. M. Hathaway, construction engineer, department of public works and buildings, Springfield, Ill.

1946 average, or 14.3% for the year.

Warning that in PRA's belief over-expansion of road programs now will cause unjustified upsurges in bid prices, Mr. Clark outlined some of the steps highway engineers are taking, often with contractor endorsement. These include efforts to gear long-range programs to a continuing level that will allow top efficiency in equipment manufacture and utilization; selection of only urgent projects for early letting; postponement of others to conserve technical manpower; establishment of firm prices; elimination of contract elements that promote large contingencies; flexible specifications that eliminate unnecessary hand-work and encourage fullest use of new equipment and methods.

In answer to AGC claims that "contractors can handle more work" Clark repeated the fact borne out in recent analysis that 31% of the many lagging jobs last year were not up to efficiency.

### Some Prices Lower

The highway session ended with a series of "testimonials" from chapter secretaries and contractor representatives, citing stiffening of competition for work in their areas in recent months. In Arizona, bid prices from the contractor standpoint were reported "not good—more contractors than jobs." President Killean of the AGC Texas highway group reported lowering prices, with sometimes 20 to 25 bids per job. Earth-moving and paving prices are also going down in North Carolina, though structure prices are still rising due to steel. In New York, "estimates aren't high enough." From Iowa came report of one contractor who lost $118,000 on a $500,000 job.

"No contractors made any money" in Nevada, the reports continued, due to out-of-state competition, while in Illinois, the contractors are feeling the hobbling effect of a depleted highway department staff, said to be only one-third the size needed!

In conclusion, one contractor observed that "from here on some highway departments are getting 'contractor aid' as well as federal aid," while J. Rutledge Hill, of Gifford-Hill, Dallas, reminded fellow contractors that they should recall the costly lessons of the 20's and 30's and remember that the "law of gravity" in bidding won't work.

Milo Flickinger of AGC at Springfield, Ill., made perhaps the most important utterance of this part of the meeting, by noting that a way must be found to increase state highway revenues. Revenues are staying practically stationary while construction prices have doubled. In some states a serious crisis in ability to match federal road funds is impending, and we have the spectacle of governor candidates bragging that gas taxes haven't been increased, while roads in their states are fast deteriorating.

Surprisingly, noted Mr. Flickinger, oil producer interests are combating gas tax increases. Illinois has made a constructive start by setting up a commission to report on the state's long-range road needs, as a means of intelligently estimating and seeking new revenue needed. Mr. Flickinger, in contrast to other reporters, saw no expectation of lower construction prices as long as labor costs continue high.

### Joint AASHO-AGC Meeting

Fast becoming one of the notably important organizations for advancement of highway efficiency, the AASHO-AGC Cooperative Committee met again in Dallas. An all-afternoon session was led by a panel consisting of D. C. Greer, state highway engineer of Texas; Pres. Killian, AGC Texas highway chapter; Charles Sells, New York; J. J. Corbett, Mo.; Morris E. DeWitt, Mo. (committee past pres.); A. C. Clark of PRA; J. A. Elliott, chief PRA division at Dallas; C. M. Hathaway, Ill.; highways; H. J. Kirk of AGC staff, Gayle Armstrong, 1947 committee president.

Important new cooperative development discussed was the need for establishing joint committees between the local AGC chapters and the state highway departments. Mr. Greer told of benefits already experienced from such a joint effort in Texas. The Texas highway department recently asked AGC to form a local committee to come to the department with suggestions for making highway work more inviting to contractors. Fourteen very practical and constructive ideas were presented and passed on to the highway field staff for comment. As an example, one suggestion pointed out that while the highway department was legally required to give contractors two weeks' advance notice on lettings, this was too short a time for contractors living in far corners of the state. As a result, the state agreed to allow 30 days' notice, and early in 1947 it skipped a letting in order to work to the new schedule.

Cooperative thinking in Missouri, according to Jim Wagner of that state, has led to some easing of specifications on farm-to-market roads, and other changes welcomed by contractors. Missouri's construction engineer, J. J. Corbett, pointed to an important fact, namely, that old timers in the highway department field staff have a hard time changing their life-time habits, and that specification changes must be thoroughly explained and sold to resident engineers. In Missouri, a series of regional meetings was held for this purpose.

### Road "Spec" Changes

Charles Sells, New York state director of public works, told of the situation in his state in which current work has been performed under two sets of specifications, old and new. Specification changes have been worked out during the past year, as a result of careful study, but such a large volume of plans had been designed and "specs" prepared under the old rules that the state didn't feel warranted in taking valuable time and manpower to revamp this work. Most of the projects so involved have now been let, and 1948 work will be entirely to new specifications.

Mr. Sells touched on a point of criticism often heard in New York, namely, the red tape and delay involved in accepting bids and making monthly and final payments to contractors. As much as eight weeks has often been needed, due to legal requirements including the pre-audit system now in force. Effort is being made to correct this situation. According to AGC president D. W. Winkelman of Syracuse, contractors could tender 2% lower bids if promised a quick go-ahead signal and prompt payments.

Mr. Winkelman also testified to difficulty with engineers assigned to his contracts, who failed to fall into the spirit of new specifications due to long-time habits. He counseled highway department brass hats to take resident engineers to school on "spec" changes.

This committee session also gave time to the problem of low engineer pay. D. C. Greer of Texas, who has served on national AASHO and HRB committees on the problem, reported that some progress has been made in raising salaries of younger men. But this trend has reached a point where no further progress can be made until department heads and other top personnel are raised. The whole problem in turn runs into the question of state employee pay levels in general, as reported in several states.

Under a resolution passed, all AGC chapters were urged to seek young men to interest in a civil engineering career. Contractors, too, pay engineers disproportionately low salaries, compared with the take-home pay of tractor-operators, and this fact was said to be a disquieting one to thoughtful employers.

# EXPERIENCE *is The Best* GUIDE!

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Experience has proved that the longer a rope lasts, the lower is its cost per unit of work done. Less time, too, is wasted in making replacements.

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★ Look twice and you'll see that the contractor has welded two 1,000-gal. tanks end-to-end to make this long pressure tank, which is sprinkling in conjunction with rolling of reworked blade-mixed stone base (US 82 through Honey Grove, Tex.)

# With Public Construction Co. of Denton, Texas, on East Texas Projects in 1947

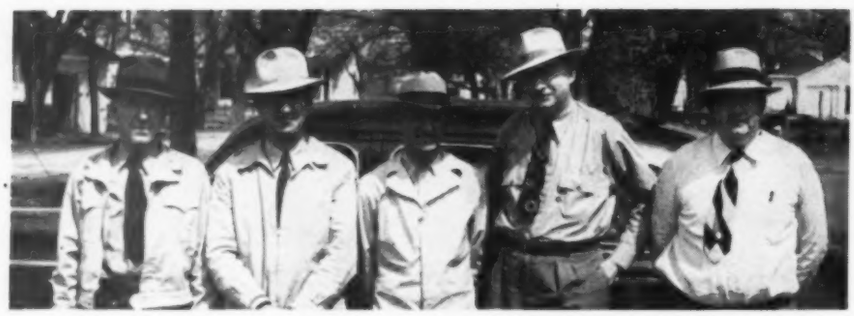
DOWN in Texas one of the best known contracting men is a guy named Jagoe. W. M. Jagoe heads up Public Construction Company, of Denton, an outfit which completed many miles of road contracts during 1947, and has averaged several sizeable contracts per year of late.

This company specializes in asphalt paving, and more lately in hot-mix work, having been one of the firms to get into hot-mix production in a big way on war projects. Fellow contractors as well as state highway men have considerable respect for this firm's way of running jobs. You could tell what we mean just by coming onto one of their projects and standing around and watching for awhile. He has good men in charge, for one thing, and somehow or other everything seems to run a bit more smoothly than usual. His key men are well paid and usually receive a yearly bonus.

Public Construction Co., like other contractors in Texas, has been able to take advantage of the excellent way the state highway department has laid out its parcels of work; enough black top road jobs in a certain area in a single season, for example, so

★ Heavy pneumatic roller drawn by an International Farm-all secured final compaction

★ The stony materials in the old bituminous roadbed were scarified and bladed down to subgrade, reworked thoroughly, spread, and rolled with steel wheel and pneumatic rollers



★ "Monday AM line-up" on the US 82 project through Honey Grove—W. M. Heath, state dist. maint. foreman; F. L. Sawyer, res. engr.; S. M. Goodman, with Public Construction Co.; F. M. Davis, district engineer; J. W. Cravens, dist. soils engineer. Lee Cartwright (not shown) was the contractor's superintendent

★ Adnum finisher fed by converted army truck—this photo and two below show hot-mix resurface project, US 82, Texas

★ Placing leveling course—hand rakes used to stack up the outer edge and see that stray loose gravel is smoothed as the spreader travels

★ A new Buffalo-Springfield roller is being taken over the center to help remove last trace of jointing

that if one contractor is lucky or smart enough to bite off several near each other, he can make himself a piece of change. Such business, we are told, has helped the state get somewhat lower prices, so it makes everybody happy.

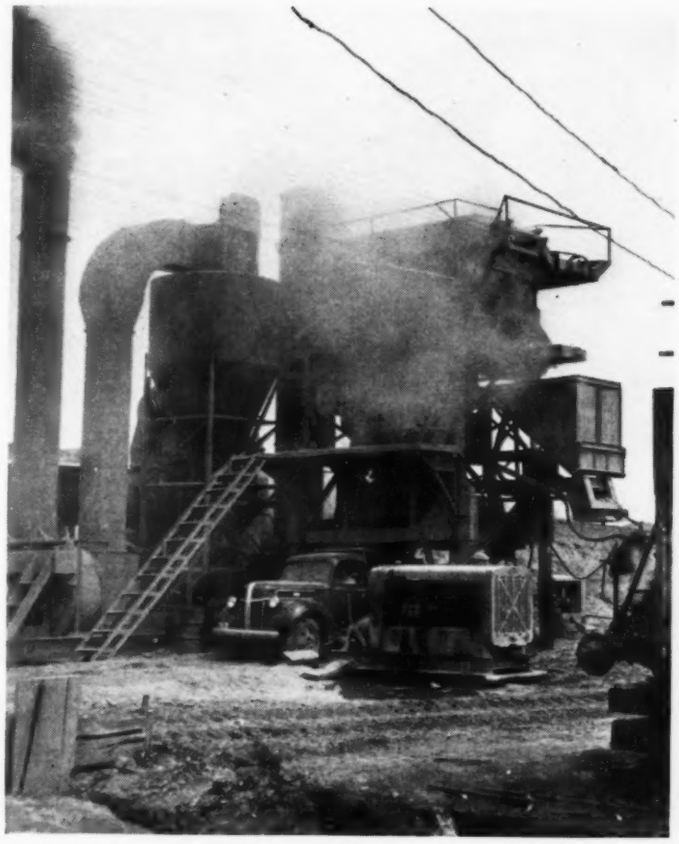
### Boss a Mechanical Engineer

But we forgot to mention the most interesting thing about Mr. Jagoe. One of the key facts of his life as a contractor is that he is a mechanical engineer with a bent for equipment design. During the war when contractors had to take and use any contraptions that would run, the headquarters shop of Public Construction Co. was full of the clanging sounds of men at work, rebuilding old equipment and hooking it together in all manner of new combinations. Much equipment such as material belts and elevator units, were literally manufactured out of scrap.

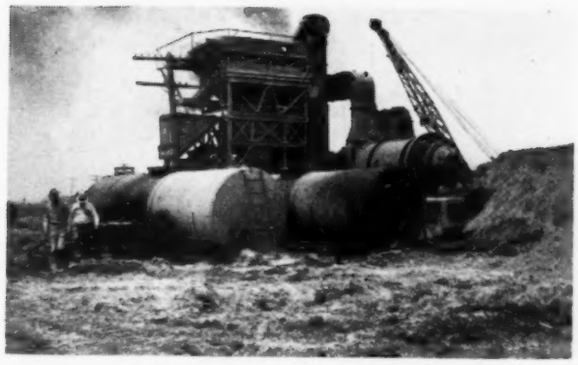
Early in 1947, the R&S editor ran across this company's trail again, this time in the Paris district in East Texas. Accompanying these words are some of the photos taken that day. Most interesting we believe are the scenes of the 1,000-ton-per-day hot-mix plant, set up to serve bituminous needs of current projects on U.S. 82 and other nearby jobs.

Proclaimed by some of the boys as "the best hot-mix plant in Texas," it consisted of a contractor-designed material hopper, a Simplicity System dryer, a Cedar Rapids Symons, a Madsen mixer, two 12,000-gal. asphalt storage tanks, a 10,000-gal. portable water tank designed as a trailer, a 6,000-gal. fuel tank, also portable, a 1½-yd. Northwest crane, and four diesel belt-power units.

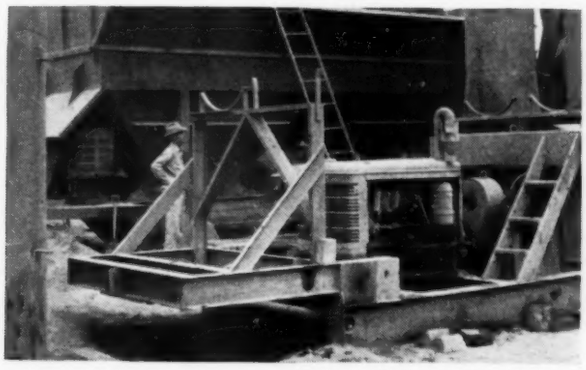
The most unusual feature was the specially designed material hopper, a 4-bin affair for which even the diesel-engine-powered feeder was built in the contractor's shop as a postwar expedient.



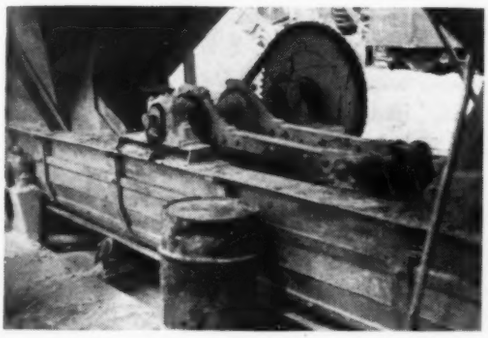
★ General view of plant. Caterpillar 13000 Diesel unif in foreground powers the mixer and screen



★ How the two 12,000-gal. asphalt storage tanks were located in relation to plant. Caterpillar 8500 unit powers the drier



★ One of four diesel power units—this is an International on the dust fan



★ (Left) The reciprocity belt feeder is powered by a diesel engine unit. (Right) Portable 10,000-gal. boiler feed water tank, designed as a trailer and fabricated in the contractor's shop. Seen here on skids, it has a rear axle from which dual wheels have been removed

★ (Left): Contractor-built feed box with four compartments

★ Two hand grease guns were kept on hand, and all greasing done twice daily during a fifteen-minute shut-down

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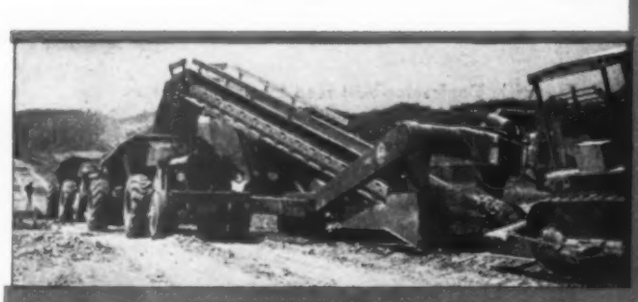

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**The Euclid Loader has set new records for earth moving on many types of jobs. It has cut costs and increased production on such work as dams, levees, airports, highway and railroad construction, industrial plant grading, and overburden removal in strip mining.**

**The wide cutting blade and mold board plow send a steady flow of material to the 54″ belt driven by a diesel engine mounted at the rear of the Loader. Maximum cutting depth is 24″ — grading cuts can be made up to 9′ 6″ in width. Three control levers within easy reach of tractor operator start and stop the belt and adjust the cutting edge for angle and depth of cut. Heavy duty design and construction assure long life and big yardages at low cost.**

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### Portability the Aim

As with nearly all users of hot-mix plant equipment, Public Construction Company's objective is utmost portability. This plant was moved five times in '46, several times in '47. As set up when photos were taken, it was being run by 10 men including the crane operator. This crew also performed most of the moving, and could tear down, make a 200-mile move and get going again, all in 7 or 8 days' time.

One of this contractor's jobs in progress was the reworking and resurfacing of a stretch of U.S. 82 through the village of Honey Grove. The operation consisted of scarifying the old stone roadbed, blading material in windrows, blending in additional stone plus 30% local sand; spreading and rolling to form a tight graded stone base; then priming and applying a hot-mix asphaltic concrete surface using ½-in.-max. aggregate.

The other project in progress early last year, also on U.S. 82, consisted of a hot-mix resurface applied over about 12 miles of concrete pavement that had seen two decades or more of service. The mix was placed in 160 and 100 lb. per sq. yd. courses, the latter using 1-in.-minus stone.

★ Flame being thrown into pugmill, to loosen mix materials accumulated on the blades

## Highway Transportation Planning*

Highway transportation planning is an organized, deliberate, and rationally directed process, aiming to bring about and maintain an optimum balanced adjustment of the condition of all roads and streets to their proper and necessary uses in the service and promotion of safe and efficient, reasonably regulated highway access and highway transportation by vehicles of appropriate design, through the application of constructive effort in proportion to scientifically determined needs, and the collection of financial means for the support of that effort from all beneficiaries and from each in proportion to the benefits conferred.

Highway transportation planning of such definition and scope is certainly not the sole concern or responsibility of state highway departments. It calls for actions and decisions far beyond the capacity of a Federal Public Roads Administration. It calls for the unified co-working of many agencies and groups: The cooperation of highway officials of the nation, state, city and county; of motor vehicle administrators; of police officials; of the legislative branches of the state and Federal Governments; of road users; and of vehicle manufacturers.

It is a remarkable fact that motor vehicle manufacturers, by a concerted action to improve, and more exactly define the designed capacity of their vehicles, and through the recent invaluable assistance of the Automotive Safety Foundation, of which they are the principal support, should be taking, as they are, a leading part in bringing about the needed multilateral cooperation toward many of the objectives of highway transportation planning as here defined.

Such cooperation and broad planning is being achieved state by state, one after another. The results that have issued from it in California, the even more gratifying results soon to appear in Michigan, are certain to inspire similar effort in many states.

The Public Roads Administration is willing and anxious to take its part. It was for this use, exactly, that the highway planning surveys were conceived; to these ends every item of the recommended outline of needed fact gathering was directed. A recent General Administrative Memorandum (No. 319, issued Sept. 24, 1947) renews our promise of cooperation, and repeats an earlier suggestion of the manner in which information, that can be well assembled only by the highway planning surveys, can be addressed to the ends of highway transportation planning.

The state highway departments cannot, if they would, avoid the responsibility of major contribution to such planning effort when it is undertaken, as surely, soon or late it will be, in every state. The state highway planning surveys will be the expected source of most of the facts required in that planning.

May I, in closing, suggest to the head of each state highway department here attending, that he take a fresh look at his highway planning survey after the approaching holidays; that, patiently, for it will require patience, he read the full text of General Administrative Memorandum No. 319; and, facing toward the west from whence a new wind is blowing, decide for himself, whether he is going to be ready, as the inevitable occasion will require, to fulfill the requirements of this thing called highway transportation planning.

*From a paper presented Dec. 8 by Herbert S. Fairbank, Deputy Commissioner, Public Roads Administration, at the 6th annual meeting the Southeastern Association of State Highway Officials, Miami, Fla.

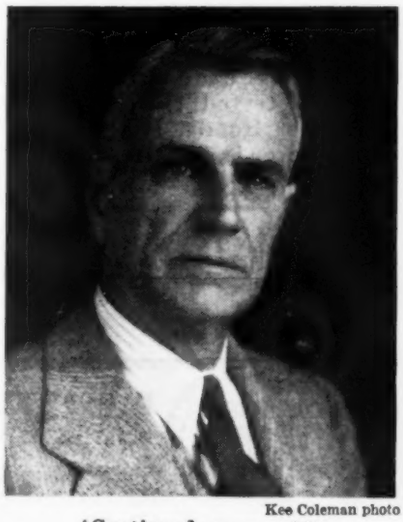
## A.G.C. of Missouri Elects Maitland

The Associated General Contractors of Missouri, at its 22nd Annual Convention in St. Louis Jan. 6 and 7 voted to participate in the Army's national defense program by sponsoring an Engineer Aviation Battalion.

Officers elected for the year 1948 were President Alexander Maitland, President, Kansas City Bridge Company, Kansas City, Missouri; Vice-President J. R. Bushman, President, Bushman Construction Company, St. Joseph, Missouri; Treasurer J. M. Joyce, Vice-President, Cameron, Joyce & Company, Keokuk, Iowa; and Secretary and Manager E. C. L. Wagner, Jefferson City, Missouri.

## Miller of Asphalt Institute Retires

Raymond Harsch, vice president of The Asphalt Institute, announced the retirement of Dan Miller, managing engineer of the Pacific Coast Division, after 16 years of service in that capacity.



Kee Coleman photo

(*Continued on page* 91)

# YOU DON'T HAVE TO BEAT YOUR BRAINS OUT BUILDING OR MAINTAINING ROADS WITH A "SPRAY MASTER"

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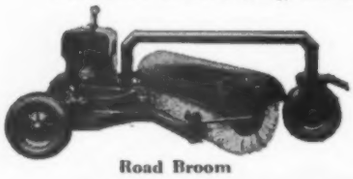
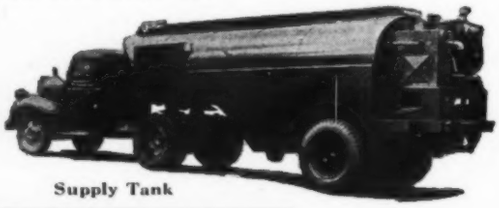
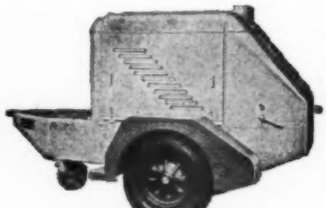


Road Broom



Supply Tank



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# Why Contractors Lose Money

**Five major types of errors which jeopardize profits and timely comment on each by an engineer of wide experience in dealing with contractors**


***By E. T. Nettleton***

Associate Highway Engineer
State Highway Department, Connecticut


IN CONSTRUCTION contracting, as well as in other private enterprises, concerns either fail or succeed according to the balance between profitable and unprofitable projects. No endeavor in life is static, and probably the construction industry is the farthest removed from such a condition. Unfortunately, the per cent of failures compared to the per cent of successes in the contracting field is greater than in most other types of enterprises. Most laymen, as well as those contractors who fail, ascribe this condition as a natural occurrence in a hazardous industry. It is true that the fortunes of industries will vary according to the hazards involved.

This assumption brings up the question, "What is 'hazardous'?" Webster's dictionary defines "hazardous" as "dangerous, risky, perilous, or chance taking." With this definition it is quite logical to classify almost any private enterprise as being hazardous to some degree. From uninterpreted statistics one might easily assume that construction contracting is naturally an extremely hazardous undertaking. However, it is quite possible to show that the errors made by contractors rather than the vicissitudes of nature are the principal factors which account for the present extremely unstable conditions in the construction industry. It is also quite plausible to assume that should these mistakes be eliminated the construction industry would be placed in a sounder financial position.

### Recognizing Errors

There are those who believe that the school of hard knocks is the most forceful teacher. This theory may, in some cases, be all right, providing that the hard knock is not a "knockout." In most cases the trial and error procedure is costly. The more astute business man would prefer to recognize the errors of others and refuse to make the same miscues himself.

The first step, after the acknowledgement of a bad situation, is to locate the causes which have produced the undesired status. Records and personal knowledge of failures occurring in the last quarter of a century show that practically all failures in construction contracting may be attributed to one or more of five major sources of error. Listed in descending order they are faulty bids, insufficient finances, improper management, inexperienced job personnel, and unforeseen conditions.

### Faulty Bids

Faulty bids do not happen; they are caused. Naturally, nobody deliberately makes a faulty bid. However, as long as the human element enters the picture there is always the possibility of carelessness, misjudgment, and lack of knowledge on the part of the estimator. Carelessness may consist of mathematical or typographical errors. Misjudgment may consist of omission of various direct and indirect cost units, unwise unbalancing of bids, misunderstanding of project conditions, endeavoring to take work under costs in order to meet payments for equipment, or attempts to take business from a competitor regardless of costs. Lack of knowledge may lie in improper information on wage schedules, material quotations, production rates, indirect expense, and specifications. There are those persons who insist on bidding in the few localities where unscrupulous politicians or racketeers hold sway. Although such conditions should not exist, it is foolish for a single contractor to risk his personal finances by trying to battle against right or wrong on a construction project where he is not wanted. Such a problem requires collective action by a strong trade association.

### Money Problems

Insufficient finances are not a matter of conjecture; they actually exist. Contractors only over-extend themselves financially when they fail to ascertain their safe financial limitations. Often their pride in desiring to appear important overshadows their common sense. Too little attention is paid to analyzing the net quick assets which are needed to meet payrolls, material charges, and retained percentages. Too many contractors place all their finances on one project, without heeding caution of the old adage that it is not wise to place all of your eggs in one basket.

### Poor Management

Improper management is not inevitable; it is brought about by individuals. Executive personnel often fail to organize a business for profit. There may exist too many high executive salaries to be met in relation to the volume of business obtained. Executives may spend too little time in their construction business and too much time in outside activities. Then again executives may fail to assume definite duties and limitations of control. As a result there may be overlapping of duties, omission of duties, or demoralization of the job supervisory personnel under them, caused by the existence of too few or too many bosses. Management may fail to modernize the equipment or to keep equipment in suitable repair. Either or both of these facts cause inefficiency, which in a competitive industry spells disaster. On the other hand, management may over-extend the firm's credit by purchasing too much equipment on a basis of long-term payments only to find later that the business is saddled with idle equipment upon which payments must still be made. Management may fail in attempting to regulate the volume of business in order to avoid peak loads with excessive overtime payments for labor, and to eliminate slack periods with non-profitable payments to key men not gainfully employed.

### Green Men

Inexperienced job personnel are not on the payroll by chance; they are personally selected by management. Executive officials very frequently employ inexperienced job supervisory personnel because of their failure to properly screen the experience and character of the various individuals before hiring. Many administrators think they are saving money when they employ underpaid superintendents, engineers, cost keepers and foremen. With ever changing job

conditions and little chance to check upon the efficiency of the job personnel until it is too late, the old saying, "Penny wise and pound foolish," holds true. All too frequently the job personnel does not have time, nor are the men properly taught to keep accurate daily cost records. No project has been pulled out of the red by knowing the actual costs after the work is completed. Inefficiency and financial losses are brought about by failure of the job personnel to use a job schedule to check on the progress and to use as an aid in the interlocking of operations, ordering of materials, requisitions for equipment and labor. Many times the inexperienced personnel fail to properly service valuable equipment, much to the dissatisfaction of the master mechanic or shop superintendent.

### The Unforeseen

Unforeseen conditions need not happen; the conditions or circumstances may be anticipated. Subsurface conditions, such as rock, water and quicksand, exist and may usually be noted by those who take the trouble to properly investigate. High tides, stream flows, and all conditions, barring unusual circumstances, such as floods, hurricanes and lightning may be predicted or expected. Weather conditions and temperatures over a period of time usually approach a mean. Fires and accidents are usually caused by somebody's carelessness or neglect. They may be partially compensated for by adequate insurance. Even unstable labor and market conditions can be foreseen and allowed for within a fair and safe margin. Traffic conditions are not too difficult to predict and location of underground facilities may be obtained from public utility records. Types and locations of existing structures which may be affected by deep excavations or blasting may be seen by those who only look.

With care all five major factors which cause business failures in construction work may be either entirely eliminated or controlled within the bounds of safety. Faulty bids may be eliminated by doing more scientific estimating and less "guess-timating." Lack of sufficient finances to handle the work to be bid on can be ascertained in advance. Pride may then be swallowed by refraining from bidding for work in excess of financial limits. Improper management is a matter for reorganization while the company is still solvent. Inexperienced job personnel can be eliminated by dismissal of so-called leaning relatives and low paid supervisory persons. Experienced supervisory personnel can be obtained if management will provide financial inducements commensurate with ability. Unforeseen conditions may, in nine out of ten cases, be foreseen conditions if only proper care is taken in the first place to look for them.

Learn from the mistakes of others; you cannot possibly live long enough to make them all yourself.

(*Any opinions expressed in the above article are those of the author, and do not necessarily reflect the views of the State Highway Department of connecticut or of this publication. This article may not be reprinted without the permission of the author.*—ED.)

●

**Fabricated Structural Steel Shipments**—Shipments of fabricated structural steel for the year 1947, according to reports received by the American Institute of Steel Construction, Inc., amounted to 1,915,144 tons, an increase of 23.4% over the 1,551,607 tons shipped in 1946 and 30.7% over the shipments in the averaged pre-war years 1936/1940. Bookings amounting to 1,628,756 tons did not quite equal last year's, but were 8% over the 1,509,496 tons reported in the pre-war years. The tonnage available for fabrication at Dec. 31, 1947 was 671,091 tons as compared with 646,090 tons at the end of the previous year.


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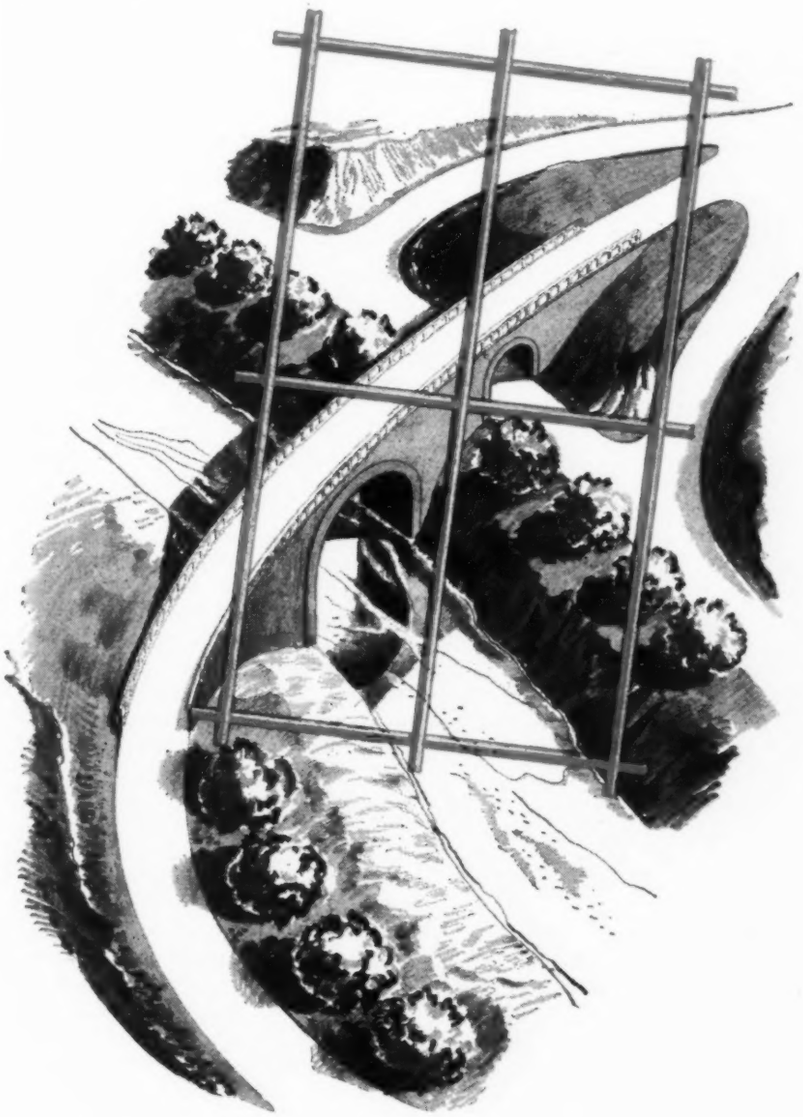

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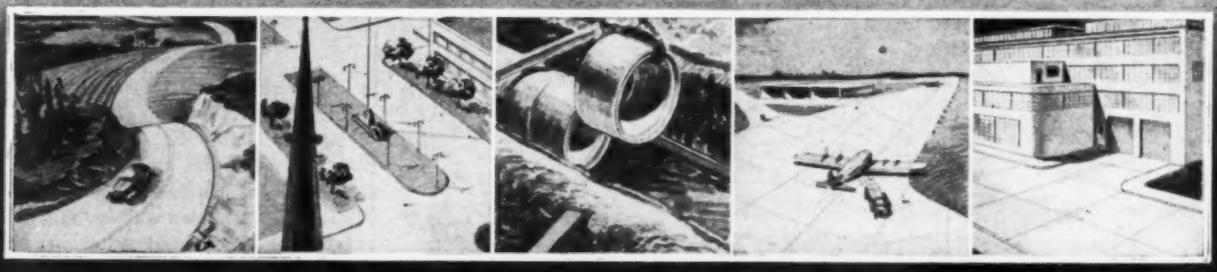

ROADS · BOULEVARDS & STREETS · PIPE · AIRPORTS · FACTORY DRIVEWAYS

(*Continued from page 72*)

the upper system was on the drill road which had been shot out about 90 ft. above the quarry floor level. Adits for the upper system sloped upward to facilitate mucking and were slightly longer than the lower adits to eliminate overhang at the top of the face which might be caused by the dip of the rock into the hill (see Fig. 2). The total length of adits and cross-tunnels for the second blast was 2,600 lin. ft. Driving of these coyote tunnels was completed on Oct. 27, 1947. Loading was started on Oct. 28 and was completed on Nov. 5, but the blast was not made until Nov. 8.

### Loading Innovations

The upper tunnels were loaded heavily in an attempt to break the rim back to a safe slope. An overhanging back-slope would have been very dangerous to work under and would have required expensive scaling and secondary blasting. Sand for packing, or stemming, was blown into place in the upper as well as the lower adits by a Presswell gun. This was much faster and cheaper than the use of the plow. Another innovation was the use of a metal sled, or cradle, into which the Nitramon cans were loaded and skidded to the end of the adit with an air-operated hoist. Loading for the blast was facilitated greatly by these several short-cuts.

The loading plan of the second blast, or for quarry No. 2, is shown in Fig. 3. The total charge of explosive, including Nitramon and primer, was 526,925 lb. The firing lines were run to the temporary visitors' observation point about 2000 ft. upstream from the dam and the blast was set off at 11:45 a. m., Nov. 8. Results were satisfactory although there were many large pieces which will require drilling and reshooting. The rock in this quarry was thick-bedded and was only slightly weathered. As a result, breakage was not as good as in Carden's Bluff quarry where the entire volume was weathered and the joints were loose. This shot was designed to produce a minimum of 335,700 cu. yd. of solid rock, but with swell and overbreakage will yield at least 800,000 cu. yd. This overbreakage was especially large at the back of the quarry area where the line of fracture was under and through a shale bed. This shale is thin-bedded and broken. It has very little structural strength, especially near the surface, and broke down quickly as soon as the supporting quartzite was removed. Except for this shale the rock of the quarry muck pile is clean, durable quartzite. Quarry No. 2 blast was the largest coyote tunnel blast ever fired from the standpoint of material broken and amount of explosive used.

A third quarry for coyote hole blasting had been started on Oct. 28, before Quarry No. 2 was completed, with its floor at elevation 1950 (see Fig. 1). Adits and cross-tunnels totalling 2,100 lin. ft. were being driven at two levels similar to the quarry No. 2 layout, from which a yield of at least 600,000 cu. yd. of loose rock is expected.

### Acknowledgments

Watauga Dam was designed and is being constructed by the Tennessee Valley Authority, under the general supervision of C. E. Blee, chief engineer. George K. Leonard is project engineer at Watauga. Edward C. McClenagan, construction superintendent, is in general charge of all construction work, assisted by Jack B. McKamey, assistant construction superintendent. W. Dean Simpson, general quarry foreman, supervised all work in connection with the drilling, loading, and firing of the tunnels. The writer is construction engineer, and Sidney N. Smith is assistant construction engineer. Claude L. Brownell is project accountant, and Samuel C. O'Briant is cost engineer.

•

**Increase in Minnesota Highway Traffic**—Traffic on Minnesota trunk highways in 1947 was 12.5% heavier than in 1946, according to counts at the automatic photo-electric traffic recorder stations operated at 27 strategic points by the State Highway Department. Increase over 1941 was about 7.5%.

•

The Pennsylvania Department of Highways has recommended acceptance of bids for furnishing and applying 20,000,000 gal. of bituminous materials for maintenance work this spring; low bids total $3,186,000. About 700,000 tons of stone, gravel and slag will also be purchased for force-account surface treatment work.

About 14,000,000 gal. will be needed for some 3,253 miles of surface treatment. The balance will be for macadam on "farm-to-market" roads in rural areas.

"So THAT'S WHY IT SAYS Do NOT REMOVE THIS CAP!"

### Correction

The article in February "Roads and Streets," pages 104-107, entitled "Labor-Saving Methods Speed Waterbound Macadam Job," should have credited the author C. R. Hanes as the one who took the splendid photographs shown.

(*Continued from page* 75)

Brown said that for many years the state has maintained a small contruction force to construct small projects and scattered improvements on which no bids were received. The Missouri department has let the great preponderance of its work to contract, though, and we hope this little flurry of concern is soon recognized as a tempest in a teapot.

The undercurrents go deep, however. While only about one per cent of postwar federal-aid highway projects have been constructed by force account, a substantial percentage of secondary and local road construction projects have been handled in this manner in some states. And most of the huge recent mileage of heavy repairs and recapping has been done by maintenance crews.

The Missouri situation is a case in point to remind that Commissioner MacDonald's proposal of state conference is indeed timely.

(*Continued from page* 85)

Mr. Miller's nation-wide experience in the field of paving started with the District of Columbia in 1912. Later he was in charge of the reconstruction of the U. S. Capitol plaza and driveway system. He then went into the construction field as superintendent of the Warner-Quinlan Asphalt Company of Washington.

Soon after the outbreak of World War I, Miller was graduated from the Garrison School for Officers at Fort Meyer, Virginia, as First Lieutenant, and was assigned to duty on the War Plans Division of the General Staff (on the Committee of Education and Special Training). During World War I he was Professor of Military Science and Tactics at the University of Denver. He was discharged as a Captain in July, 1919, becoming a district engineer of the Wyoming Highway Department, and subsequently state maintenance engineer.

Coming to California in 1923 Mr. Miller specialized in suretyship as applied to construction contracts. In 1931 he organized the Pacific Coast Division of The Asphalt Institute.

On military leave for thirty months in World War II Miller, as a Colonel, was Chief of Staff to the Adjutant General, California State Forces.

Mr. Miller is credited with an outstanding part in helping the Institute's Pacific Coast Division accomplish such objectives as simplification of specifications by a logical classification of grades and groups of asphaltic materials.


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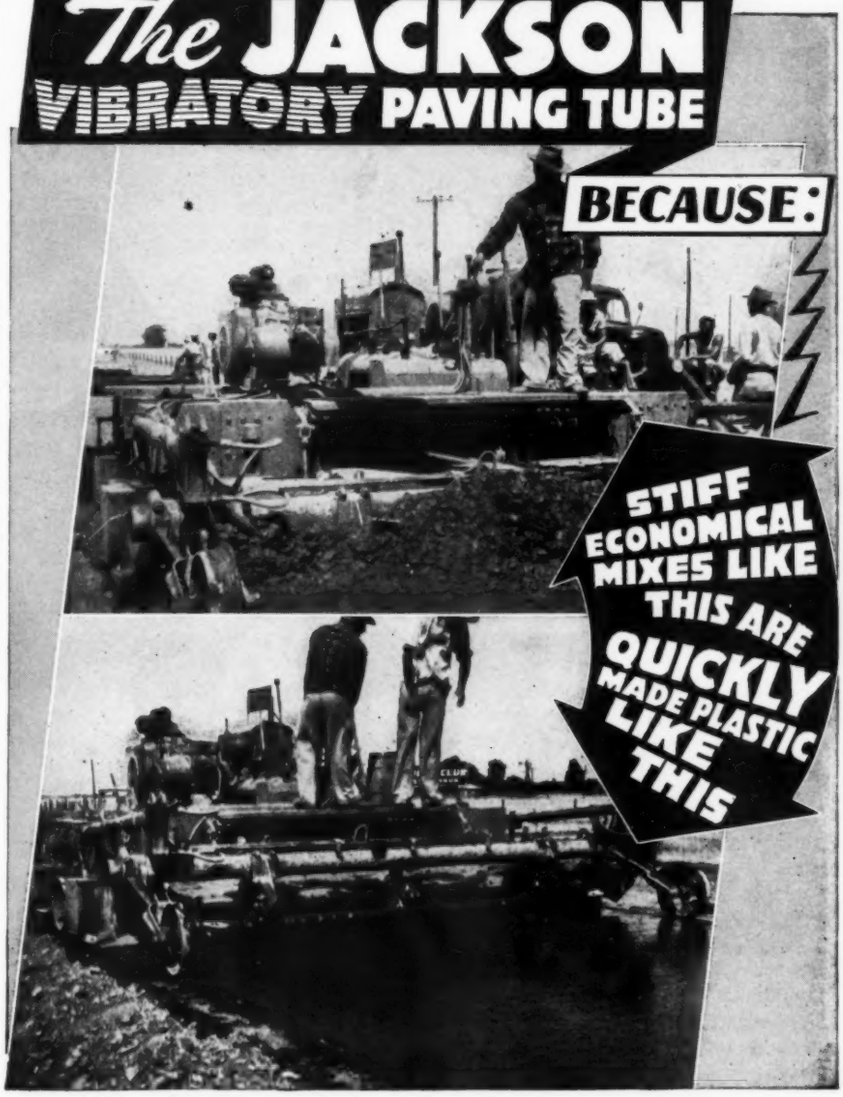


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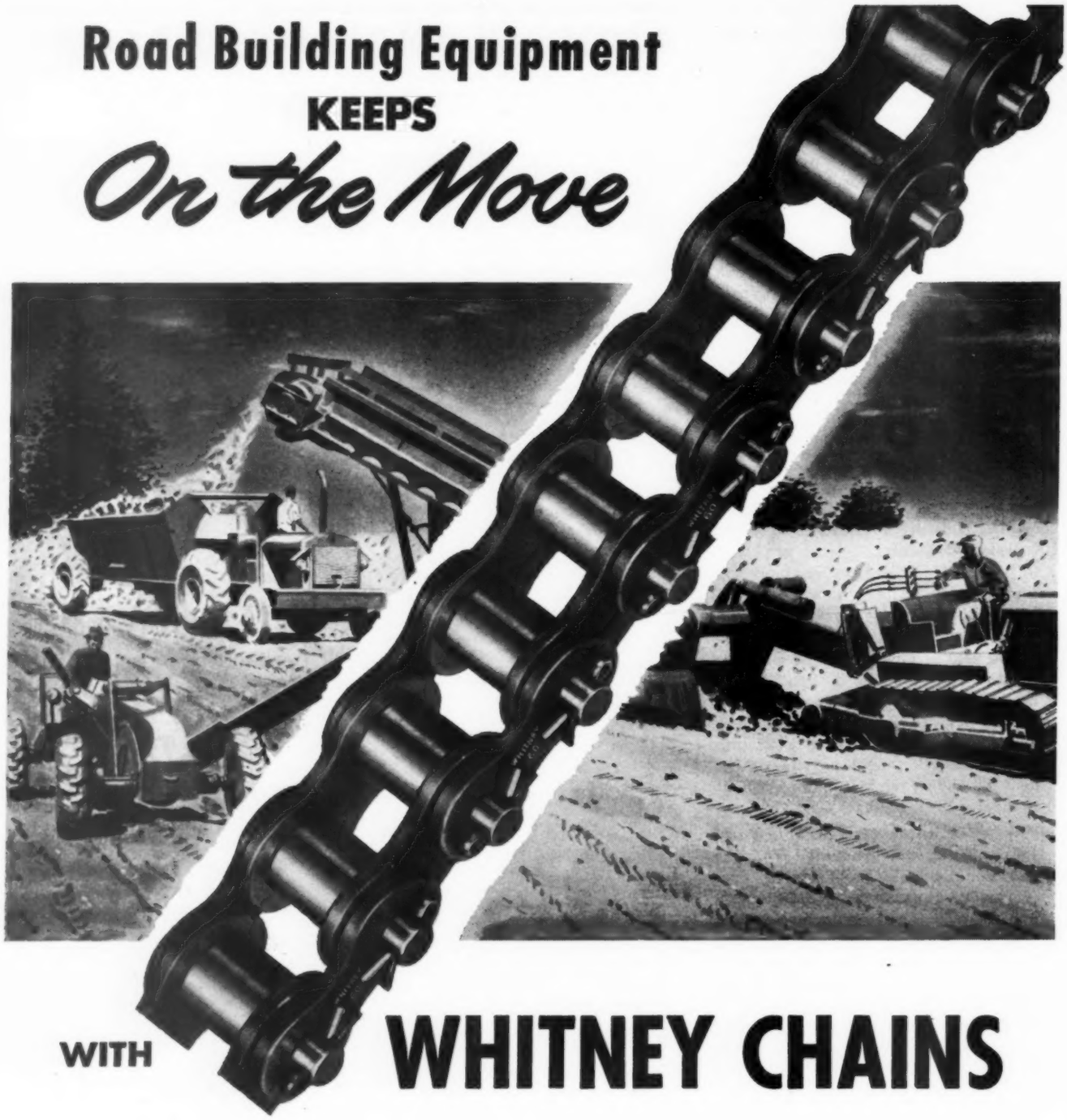

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# AED Chicago Convention

## Spotlights Changed Equipment Buying and Selling Picture

A CHANGE from seller's market to buyer's market was indicated by the subjects discussed in Chicago last month at the 29th annual Associated Equipment Distributors meeting. The 1,275 distributors and manufactures in attendance were particularly interested in such subjects as bank credit, cash discounts, inventory control, obtaining and holding personnel, and protection of private enterprise—especially small business. AED now has 995 members including 83 from Canada.

A westerner and an easterner won the two top posts. A. F. Garlinghouse of Los Angeles stepped up from executive vice-president to president, succeeding W. A. Danner of Boston. Mr. Garlinghouse has been a partner in the firm of Garlinghouse Brothers, Los Angeles, since 1923, and also general sales-manager of Gar-Bro. Mfg. Co. and Gar-Bro. Wheel Co., divisions of Garlinghouse Brothers.

The new executive vice- president is W. W. Bucher of Newark, N. J., president of R. E. Brooks Co., New York City. He has served five years as regional director, four of them concurrently as treasurer of AED.

C. F. Halladay of Sioux Falls, S. Dak. and V. J. Sheridan of Leaside, Ontario, were reelected vice-presidents. Newly elected vice-president was R. L. Arnold of Salt Lake City, Utah. Eldon M. Farnum of St. Louis, Mo., and F. G. Knight of Chicago were reelected treasurer, and executive secretary, respectively.

### Credit Costs Up

"Credit is and will be increasingly tighter and will cost more," said Kenton R. Cravens of the American Banker's Association credit policy committee," who qualified this remark by adding, "unless current changes in the commodity and security markets herald the start of a much sharper and prolonged decline or depression than can be foreseen at this time." As in other commodities, the demand for credit has overtaken the available supply.

Construction equipment distributors are especially vulnerable to credit tightening. Their heavy equipment costs more, and as a result usually requires longer term credit than do other commodities. A tighter money market will increase the existing tendency for customers to prefer equipment rental to equipment buying. Larger dealer inventories and need for more dealer credit would result. "In some lines, notably motor freight equipment," Craven said, "we have seen sales resistance and used equipment price declines because of the credit shortage just as much as a result of good supply."

In order to meet changing credit conditions Cravens suggested that distributors put their financial houses in order, consolidate, rather than expand, and budget their credit needs tightly and far in advance.

### "Town Meeting" Panel

Again this year the distributors' "Town Meeting" broke the ice and encouraged a lively discussion from the floor. Cash discounts, inventory control, servicing and personnel procurement were some of the subjects presented by qualified speakers.

M. R. Hunter of Hunter Tractor Machinery Company, Milwaukee, advocated cash discounts. He urged the distributors to pass on to the buyer the manufacturer's 1-2% cash discount. Often, the contractor who buys the equipment must spend a large part of his own capital for equipment, wages and other expenses before being fully paid by his client. Cash customers are becoming more scarce. They should be encouraged.

H. L. Burleson of the Browning-Ferris Machinery Co., Dallas, warned that many distributors' inventories are too large. Prices are unnaturally high. Allowance should be made for cancelled orders.

L. W. Gardner of Howard-Cooper Corporation, Portland, Oregon, advised distributors to overhaul only equipment for which they sell the parts.

R. L. Arnold of the Arnold Machinery Company, Salt Lake City, reminded distributors of their duty to carefully choose and train younger men who someday will take over the business.

### Service Beefs and Ideas

Spare parts, parts catalogs, safety and employee training were the chief subjects discussed at the service policy committee meeting.

Both contractors and distributors are becoming increasingly vehement in their criticism of inadequate parts lists furnished by some manufacturers. Time and money are frequently lost by contractors who are unable to order parts needing replacement. "Exploded" views and index numbers referring to catalog numbers were suggested as simple but effective aids to the field man who needs an extra part.

H. L. Burleson of the service policy committee advocated a combination of factory and on-the-job-training for distributors' service men. Safety, as well as operation and maintenance, should be taught. T. R. Holmes of Holmes-Talcott Company, Hartford distributors, described his firm's own class for contractors' maintenance men. The class is small, never more

(*Continued on page* 104)

★ 1948 Officers of Associated Equipment Distributors. (Front Row): F. G. Knight, Exec. Secy.; W. W. Bucher, Exec. Vice Pres.; A. F. Garlinghouse, Pres.; C. F. Halladay, Vice Pres. (Back Row): Eldon M. Farnum, Treas.; R. L. Arnold, Vice Pres.; V. J. Sheridan, Vice Pres.

# 1½ Billion for Roads in '48

**Continuing a series of summaries from representative state highway leaders**

## Ohio Pushes Varied Program

***By George T. Thormyer***

Chief Engineer, Bureau of Location and Design, Ohio Department of Highways

During the 1947 calendar year, the Ohio Department of Highways awarded 284 contracts for highway construction involving some $38,000,000 and improvement of 591 miles of state secondary and primary roads.

There were 117 projects carried over from 1946 involving $16,000,000 in incompleted work. Final estimates were written for 186 projects, the year leaving 215 projects to be carried over to 1948 involving $29,000,000.

Two special programs were inaugurated covering 103 miles of stabilization of secondary roads, estimated at $1,100,000, 60 projects for new bridges over 20 ft. span and 10 projects for smaller structures at $2,300,000.

### Big Signing Job

In addition, the Bureau of Maintenance and Repair resurfaced 2268 miles of bituminous pavement and placed 503 miles of traffic bound surface at a cost of $4,450,000. Two hundred twenty bridges were repainted, 110 widened and strengthened, and 28 were replaced as emergency construction, involving $545,000 for structure maintenance and repair.

The Division of Traffic and Safety concentrated on a program of centerstriping 10,560 miles of pavement and marking 3800 miles with no-passing zone lines. This Division erected safety slogan signs at intervals of ten miles on principal state highways [see Jan. '48 R&S], and has arranged to reflectorize all warning signs and replace existing directional signs on principal state highways with larger and more legible signs to be located a reasonable distance in advance of intersections. An intensified effort is being made to obtain full compliance by all cities, counties and villages in establishing uniform standards for traffic control devices as required by the Uniform Traffic Act.

### Ohio Research Correlated

Responsibility for stimulating and correlating research leading to improvement of highway facilities rests with the Ohio Highway Research Board. During 1947 the Board completed an investigation of the strength of the connection between a concrete cap and the embedded end of a steel H pile. Copies of the report covering this investigation are now being printed.

An investigation was made of vibratory methods of placing screenings in macadam pavements. This method shows considerable promise and the Ohio specifications have been revised to permit this method of placing screenings.

Field surveys have been made of many miles of bituminous concrete and portland cement concrete to determine needed improvements in design, material requirements and construction practices.

The Department is completing a changeover from its old method of designating its highway system by state highway numbers and section letters, to a system based upon the state route numbers and mileage measurements. This system is better suited for keeping records as it enables the Department to locate in the field any point on the highway system by referring to permanent markers established at intervals of two miles. It is also used advantageously by Division offices in the preparation of plans and identification of the beginning and end of projects.

### Extensive Air Maps

The aerial mapping and survey unit of the Bureau of Location and Design photographed more than 3000 square miles of Ohio terrain including both urban and rural areas. Information secured through proper interpretation of these photographs assures maximum economy in locating and designing our future highways.

Oblique aerial photographs have become very valuable in presenting the Department's conception of proposed improvements to the general public.

While the Department has not completed all arrangements for its pro-

★ Were You There? At the Banquet of the American Road Builders' Association, Washington, D. C., January 27, 1948.

gram for 1948 it is anticipated that the expenditures for this year will exceed those for 1947 by approximately 10%.

## Texas Completes Large Farm-to-Market Mileage

***By D. C. Greer***

State Highway Engineer, Austin

The calendar year 1947 made Texas road building history, with contract awards passing the $70,000,000 mark and bringing the postwar total to $148,098,395 for building or improving 7,621 miles of state highways. Paved mileage increased from 25,088 to 27,130. State maintained mileage stood at 28,344 at year's end.

Some 3,751 miles of farm-to-market roads were being maintained on the state system, an additional 1,360 miles were under construction and funds were earmarked to bring the state farm-to-market system up to 7,500 miles during 1948.

The scope of Texas road building during the last half of 1948 hinges on the new federal-aid act which the National Congress will soon consider.

Texas is among the relatively few states that have kept up a construction schedule such that they will be ready for new federal funds at the theoretical conclusion of the current 3-year program.

Many Texas observers fear there will be a gap of six months to one year before new funds become available, giving the less progressive states more time to catch up with their original three-year program. A more optimistic view is held by others who think Congress will make the new funds available next July 1, permitting the more progressive states to forge ahead with their road building, yet giving the slower states more time to finish their original program.

Without considering the possibility of a new federal-aid program for the last half of 1948, the Texas highway department has scheduled construction for the year estimated to cost $52,000,000. This calls for improvements to 4,211 miles of roads. Included are 2,300 miles of farm-to-market roads, 455 miles of primary highways, both under the original three-year federal aid program. Included also are 1,456 miles to be modernized and rehabilitated with all-state funds.

A new type of county and state financing was inaugurated during 1947. Counties desiring farm-to-market roads which could not be financed immediately with state and federal funds, were offered a plan whereby $100,000 of such roads could be built each year in any county. The plan provides for the counties to furnish right-of-way and 75% of the construction costs, while the state highway department furnishes engineering, 25% of the construction cost, and assumes perpetual maintenance of the completed project.

Since the 75-25 plan became operative, 36 counties have to date elected to participate in the construction of 700 miles of farm-to-market roads which could not otherwise have been financed with currently available state and federal funds.

The Texas highway department starts the new year with a program of renewing and revising center-stripe and no-passing zone markings. We are hopeful that the dashed yellow lines to define no-passing zones will help to avoid many traffic accidents, as motorists become more yellow-line conscious. A publicity campaign is aimed at this program.

Texas' 50th Legislature adopted the Uniform Traffic Code which will enable the engineers and enforcement agencies to do a better job of promoting traffic safety. Its chief effect on the highway will be legalizing and permitting enforcement to back up warning signs. It further establishes a uniform standard which counties and cities will be required to follow in future installations.

## California Lettings at 70 Million Pace

***By G. T. McCoy***

State Highway Engineer, California

Back in 1910, California voters ratified the first bond issue for development of the state highway system. In 1923 statutory provision was enacted to provide a pay-as-you-go method of financing highway construction by means of a tax upon gasoline. The year 1947 will stand out as providing the next most important step in California highway annals when the Legislature by the Collier-Burns Highway Act provided the means for comprehensive development of the state's highways, roads, streets and bridges.

Under this 1947 act the motor vehicle fuel tax was increased from 3c to 4½c, registration fees raised from $3 a year to $6, truck weight taxes appreciably increased, and the gross receipts tax on the business of operators of common carrier trucks and buses directed into the state highway fund. Under this increased revenue, provision is made for coordinated development of state highways, county roads and city streets so that solution of the ever increasing traffic problems may be expedited.

(*Continued on page* 104)

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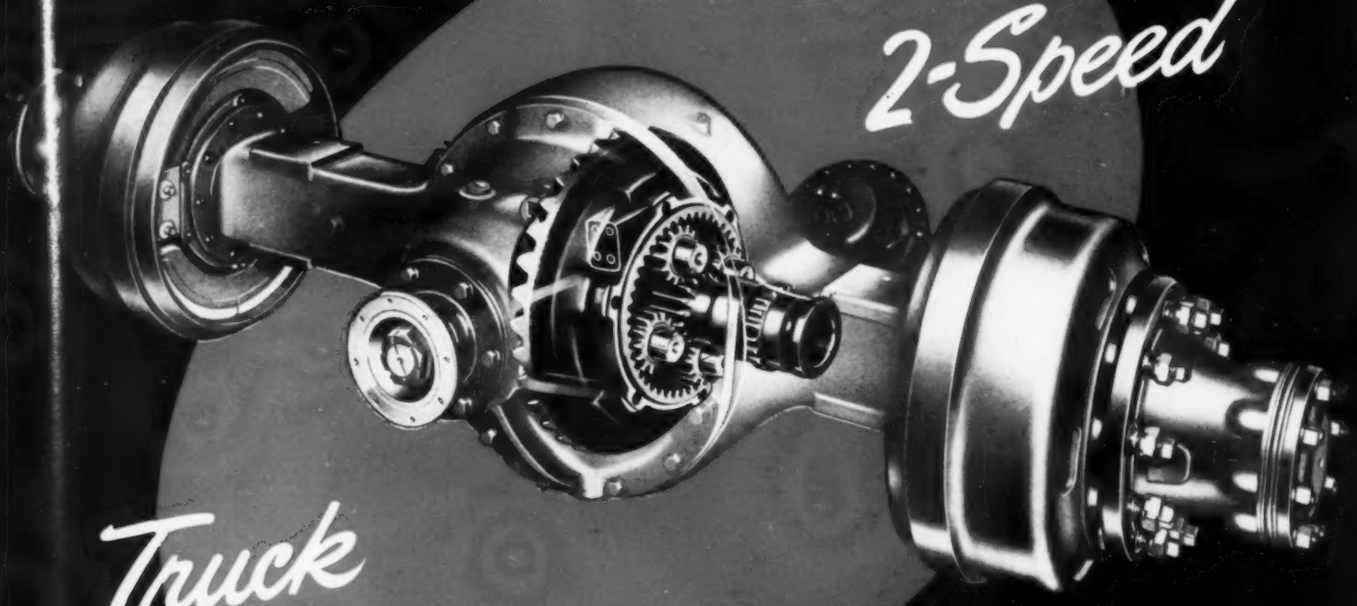

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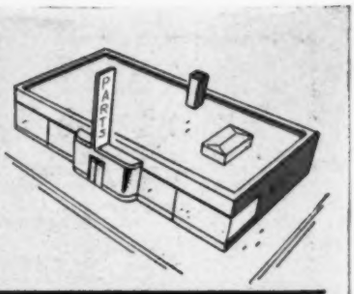


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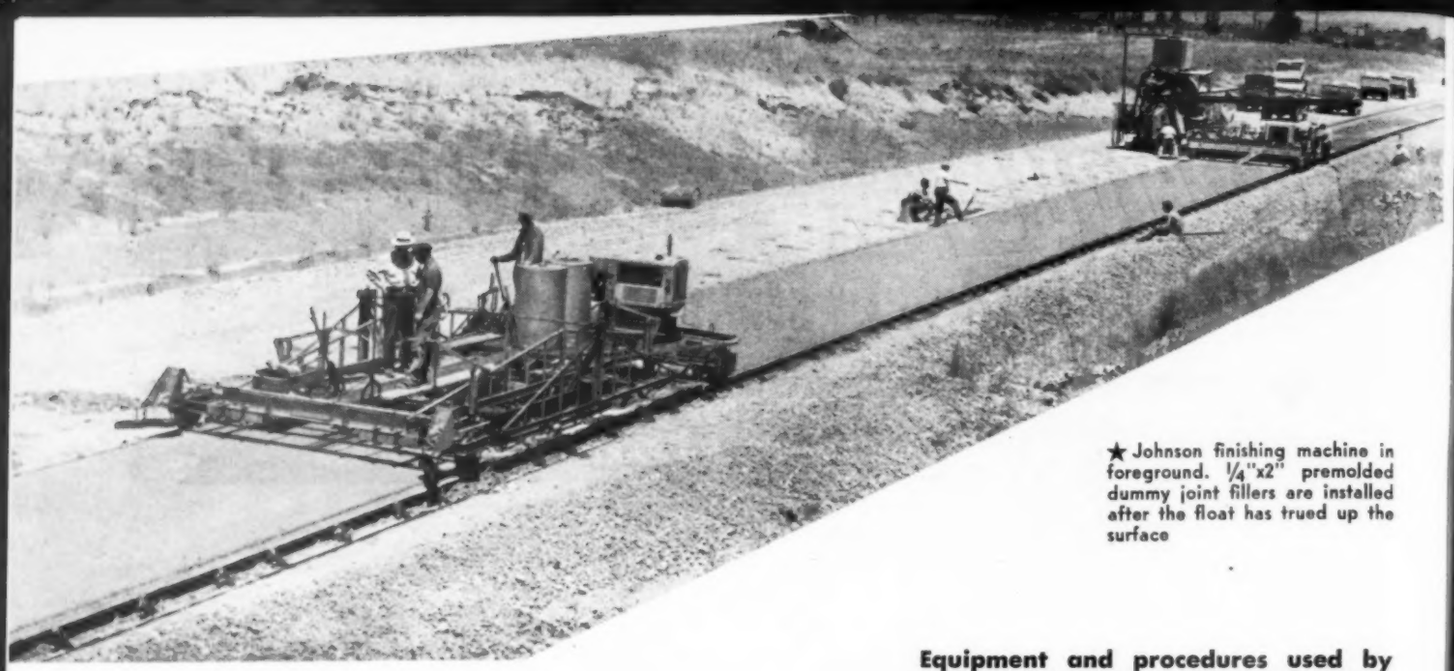


★ Johnson finishing machine in foreground. ¼"x2" premolded dummy joint fillers are installed after the float has trued up the surface

**Equipment and procedures used by Warren Northwest, Inc., on 10-1/3-mile $775,000 road project**

# Streamlining

## Oregon Concrete Paving Job


***By Ray Webber***

Assistant Construction Engineer
Oregon State Highway Department


RECONSTRUCTION of a section of the Pacific Highway in Oregon, between Steiwer Hill and Albany, has recently been completed. This new section is about 60 miles south of Portland.

The roadway design exemplifies present standards and practices and includes planning for an eventual 4-lane highway, separated by a 30-ft. dividing strip. Two 12-ft. lanes were constructed in this first stage. When traffic conditions demand, an additional two lanes will be constructed. This new section of highway has limited access. The present location eliminates a section of highway containing many curves and at times diverges over two miles from the old highway. Also, it was found necessary to by-pass one town with the new location.

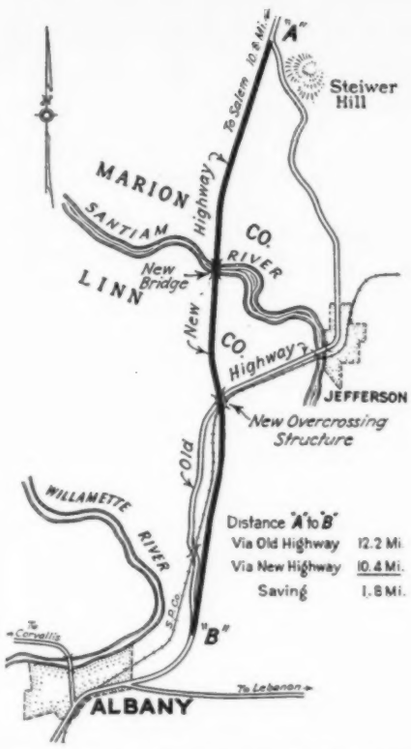
This area contains some of the most fertile land in the Willamette Valley, traversing an area in the vicinity of the Santiam River, a main tributary to the Willamette River. A new bridge was constructed over the Santiam. In order to obtain a direct alignment it was necessary to construct bridges over the old existing overflow channels. Ten such bridges were built to permit free passage of the Santiam's seasonal flood waters. Additional new structures included one overhead crossing and three small stream crossings.

★ Note minimum of confusion at mixer and the few men needed to perform high quality work

### Modern Paving Equipment

An 8-in. pavement was constructed on a 4-in. base of gravel. Shoulders 10 ft. wide were given 10 in. of base gravel topped with two inches of compacted crushed rock. Crown from centerline to edge of pavement is 0.012 ft. per ft. Shoulder slopes are 0.04 ft. per ft. Expansion joints are used only at bridge ends. Dummy or contraction joints are constructed with ¼-in. by 2-in. premolded filler placed at 15-ft. intervals transverse to the centerline. Longitudinal joint is a constructed tongue and groove with ⅝-in. tie bars at 40-in. centers.

At the south end of the project a service road was constructed as part of this job. This road serves a fringe development area which, if not so treated, would have resulted in parking problems and would have developed a very dangerous condition to traffic which uses this limited-access highway. The only access to the new highway is through previously established crossings which were in use




prior to the construction of the new highway. The minimum width of the right of way is 200 ft.

Contract for this 10.34 miles of improvement was awarded to Warren Northwest, Inc., of Portland, Oregon, at $772,724.00 including grading, subbase and paving. The bridges were constructed under separate contracts. 430,000 cu. yd. of excavated material was involved, and approximately 200,000 cu. yd. of gravel embankment was borrowed locally. 70,000 cu. yd. of 3"-0" gravel base material was used under the pavement and on shoulder construction. 140,000 sq. yd. of p.c. concrete pavement was laid.

### Form Handling Speeded

Pins for the steel road forms (Blaw-Knox) were driven with two riveting guns equipped with special driving heads, supplied by a Schramm 105 cu. ft. compressor. A special dolly was constructed to pull the pins; usually forms were stripped the following morning. A special problem arose in the forming of the required tongue and groove longitudinal joint in the center of the slab. The groove was formed by means of a formed light steel plate tack-welded on the side of the form. Holes were drilled to permit installation of ⅝-in. tie bars after the concrete had been distributed between the forms, usually immediately behind the strike-off machine.

The paver used was a Koehring 34E dual-drum; spreader and strike-off machine were Blaw-Knox; finisher, a Johnson float.

Concrete aggregates obtained from the Santiam River near the newly constructed bridge were processed through a portable Pioneer "40V" plant. A rotary screen was used in order to better wash the materials.

A Johnson concentric batch plant batched out aggregates and cement. This was a 4-compartment plant, with total storage capacity of 100 cu. yd. of aggregate and 350 bbl. of bulk cement. An automatic electrically-operated screw supplied the cement. Aggregates were batched manually.

A 1-yd. Northwest clamshell fed the bunkers. Materials were piled near the batching plant in such a manner as to require a minimum of swinging with the clamshell. One man, who had a position on top of the bunkers, was employed to keep the clamshell operator posted on quantity of aggregates in various bins. Cement was delivered from an Oregon mill in sealed box cars to a siding 2½ miles from the batch plant, and thence transported in sealed bulk cement trucks.

### Construction Details

Aggregates and cement for the 8½ sack batch were batched into dump trucks equipped with separating gates for each batch. The water-cement ratio was maintained closely at about 0.7 producing a fairly stiff yet work-

★ Johnson concentric batch plant; 100-cu. yd. aggregate storage; 350-bbl. bulk cement storage. On Aug. 29 this outfit batched 990 cu. yd. concrete for 3,438 lin. ft. or 4,584 sq. yd. of concrete pavement (single lane)

★ Portable Pioneer 40V Plant with rotary screen for concrete aggregate production

★ View of completed highway with service road constructed on the right

Oregon State Highway Commission Photo

★ Blaw-Knox steel forms, with light steel shape tack-welded to inside edge to form tongue and groove

able mix. Equipment was not permitted to operate between the forms, leaving this area true to crown and grade and obviating fine grading at the already-congested area of paver and spreader.

Upon completion of the first paved lane, equipment was permitted to operate off the previously placed lane when it had reached the specified strength of 3,300 psi. In doing this, it was required that the paver operate on section of old belting, also that the dumping skip be provided with a means to protect the pavement surface. All spillage of concrete was immediately removed from the pavement.

The concrete spreader was adjusted to leave a surface slightly higher than the finished grade, insuring that there be some material carried on the blades of the strike-off machine which was set to the required crown and grade.

### Float Operation

After the strike-off operation, a Johnson float machine was used. This machine is best described as a powered road drag, similar to the drag used in many states to shape up gravel roads; criss-cross blades cut high places and deposit material in low places as it is pulled with some means of power. The float was passed back and forth over the surface until it was all on a true plane (no high or low spots). After initial float passes, ¼"x2" dummy joint fillers were installed at 15-ft. intervals and controlled in depth to within ¼-in. of the final surface. The float was again operated over the surface and over the joint fillers, leaving the surface free of all marks. No difficulty was encountered in meeting the evenness specification of 0.1-in. in 10 ft.

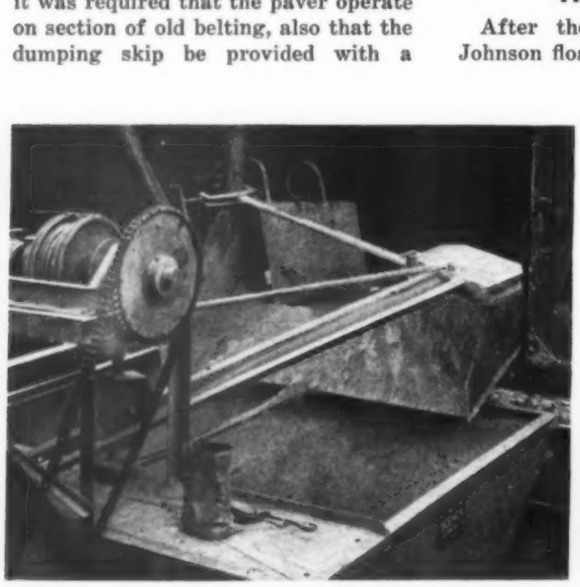
Experience has proved that with proper operation of the Johnson machine, straightedging is necessary only at the beginning of a day's run and at bridge ends and occasionally to see that a proper crown is obtained.

### Equipment Moved Across 14 Bridges

A major problem developed in moving equipment over the many bridges constructed on this job. Since there were 14 of them from 50 to 200 ft. long, it was necessary to make 28 crossings with a minimum of delay. Further, since all equipment travelling on forms had steel wheels, it was necessary to protect the surface of the bridges from scars and scratches occasioned by the moving. This was best accomplished by operating the various machines with steel plates placed under the wheels.

### Two Superintendents

Maximum production for this setup was 980 cu. yd. in 10 working hours. Consistent peak production



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was not possible due to the numerous bridge crossings, which delayed the paving operation considerably. Sustained maximum production depended upon the efficient supervision of materials and men. During the paving work, an assistant superintendent was assigned to assist in keeping up with the constantly changing conditions which might impede the progress of the work. Contrary to general opinion about such a condition, both men served effectively even though their duties overlapped. Additional supervision was accomplished by having a crew foreman at each individual division of the work. The automatic controls were not used on the paver. All operation was controlled manually by the operator.

### "Skilled" Labor Minimum

For years there has been a marked decrease in skilled paving finishers in Oregon, the result of which has been a gradual changing of specifications to include mechanical methods in order to maintain the quality or improve the standard of the completed pavement. The machinery now used is simple to operate and operators can be broken in on the job.

As to skilled hand-finishing, only two men are considered necessary, these being to dress up and edge the pavement and broom the surface. With this standard operation specified, contractors who are familiar with paving work are relieved of the fear of being unable to hire skilled paving finishers. This in turn is reflected in the competitive bid prices of the various contractors bidding upon a project. Oregon's present quality of mechanical finishing far exceeds that of hand-operation, which at times is still in use as an alternate method of paving. Principal concrete paving projects which are hand-finished are those wherein long runs with the mechanical equipment are not practical and where varying widths of pavement lanes are constructed, as in small town improvements.

### Supervision

This is a Federal-aid project designed and supervised by the Oregon State Highway Commission, R. H. Baldock, state highway engineer; H. G. Smith, construction engineer; F. D. Eason, division engineer. Resident engineers A. V. Benedict and John F. McGee divided the job into two sections. The contractor's men included J. R. Wininger, president, Warren Northwest, Inc., with offices in Portland, Oregon; R. E. Batie, general superintendent; and Ryder Jensen, superintendent.

(*Continued from page* 94)

During 1947, contracts with a total construction value of $70,300,000 were awarded by the Department for improvement to state routes and to federal-aid, county roads. State highway maintenance for the year was about $15,000,000, and purchases of new equipment about $3,400,000.

The construction contracts provided for 44 miles of hard pavement, 707 miles of bituminous surfacing (211 miles merely seal coat of screenings and bituminous binder), and 28 miles of straight grading contracts. Also included in the contracts were 202 major bridge and grade separation structures.

As an indication of the type of construction included in this program it may be noted that as of Jan. 1, 1948, the value of going contracts on six major freeways — Hollywood Parkway, Santa Ana Freeway, Harbor Freeway, Arroyo Seco Parkway, Bay Shore Freeway, and East Shore Freeway—totaled $15,300,000.

Under the new financial set-up the state highway construction program will be carried forward at a rate comparable with the 1947 volume.

### 70 Million Awards

On Jan. 1, 1948, the unexpended balances on going contracts carried into the new year totaled $37,000,000. Estimated maintenance costs for 1948 will be about $17,500,000 and contracts amounting to some $70,000,000 will be awarded. Equipment purchases will approximate those of 1947.

Under the new Collier-Burns highway act, California now operates on an annual budget basis in lieu of the former biennial schedule. It is apparent that all projects in the current fiscal year (99th, July 1, 1947, to June 30, 1948) will be under contract by March, 1948. But the new act has provided that contracts financed from any fiscal year budget may be awarded after the first of April prior to the beginning of that fiscal year. Under this provision it is possible to advertise for bids in the latter part of February or early March in order to take advantage of the full construction season. At the present time the Division of Highways has prepared plans and specifications for a major portion of projects in the 100th fiscal year budget and thus will carry on the State highway program without a break.

With the start which California now has there should be no reason to prevent continuous development of the states' highways, roads, streets and bridges during the years ahead.

(*Continued from page* 93)

than 5 or 6, and lasts only 6 hours. A factory-trained service man teaches preventive maintenance, trouble-shooting, minor adjustments, use of proper fuel, etc. Mr. Holmes said he is convinced that this maintenance class helps sales increase.

### Army Affiliation Program

Asserting that the United States' greatest vulnerability in event of war is during the build-up period, Col. Robert A. Fleming of the Corps of Engineers, Washington, called on members of the construction equipment industry for increased participation in the Army's Affiliation Program for specialized service-type units.

### Winkelman Lauds Mechanization

AGC president D. W. Winkelman gave equipment distributors and manufacturers a verbal pat on the back, saying, "My own conviction is that one of the most effective means of reducing construction costs is through increased mechanization. The new machines we are getting now are improved in efficiency. They help us as contractors to cut costs on many of our operations.

"I feel confident that in the future there will be continued improvement in the production and servicing of construction equipment, and that contractors will continue to devise many new ways to make their operations more efficient through its use.

### AED Resolutions

The following two resolutions were adopted by the Association:

1. That the Association, being interested in the welfare of the country commends the work of the small businesses and pledges its support for the success of the National Federation of Small Businesses.

2. That flood control and power development in the United States be handled under the Corps of Engineers and Bureau of Reclamation of Rivers and Harbors rather than under valley authorities, and that construction continue on a contract system in order to maintain free enterprise.

Wayne Clark, who piloted the resolution committee, said the second resolution is for the benefit of the contractors, even though the manufacturers and distributors can sell just as readily, if not more so, to the U. S. Government. "However," he explained, "the efficiency of operation under the competitive bidding system is just as high, the costs may be cut 25% and we would continue to work with the contractors as we always have."

# Emulsified Asphalt

## Mud Jacking Mix Successfully Used in Arkansas

**By C. C. White**
State Maintenance Engineer
Arkansas Highway Department, Little Rock

JACKING and leveling up of old portland cement concrete pavements is one of our maintenance problems. There has been considerable breaking up of concrete pavements and joint pumping on practically all of our main routes that are of any consequential age.

The primary causes for such action are attributed to bad soil conditions, lack of proper drainage, improper design of old pavements for present-day traffic density and weight, and the lack of intensive maintenance during the war period, which included several items of work.

Our maintenance forces prior to the past eighteen months had been using a soil-cement slurry for jacking and leveling, which consisted of 1 cu. yd. of sandy loam, 3 bags of portland cement, and sufficient water to produce a slurry of a consistency suitable for the job at hand.

It was found, however, that a slurry produced with the foregoing materials did not give us the final results desired, and that the use of such materials gave us relief only for a short period of time, as the seal was soon broken down by absorption of moisture and the continuous application of loads by traffic.

### 65 Gal. Per Yd.

In an effort to find a more suitable mixture of materials, we decided to introduce emulsified asphalt into a slurry as a medium for producing finally a semi-plastic waterproof material for leveling and under-sealing deteriorated sections of pavement. Several different combinations were tried over a period of a year, and finally the following was adopted: 1 cu. yd. of sandy loam, 1 bag of cement (2 bags during winter months), 65 gal. of emulsified asphalt and additional water to produce a slurry of the proper consistency.

It has been found that the emulsified asphalt used tends to lubricate the slurry mixture and thus prolongs the life of the slurry pumps and reduces friction of the hose. The use of emulsified asphalt has also been found to suspend the sand particles and thus makes the mix less critical as to sand content of soil used.

Numerous bar shrinkage tests have been made of the emulsified asphalt mixture with a result of less than 1% shrinkage factor on all specimens taken. The material used meets Arkansas specifications (AE-2), which is essentially the same as Asphalt Institute SS-1.

Several of the most heavily traveled concrete highways in Arkansas have been treated with the emulsified asphalt-soil-cement slurry over the past year, with excellent results being obtained. In numerous instances only one treatment is necessary in making what seems to be a permanent repair.

●

**All-Aluminum Bridge Span**—The first all-aluminum bridge span in history was installed in 1946 on the Grasse River bridge of the Massena Terminal R.R. at Massena, N. Y. The aluminum span, one of seven in the bridge, is 100 ft. long.

★ Another general view of complete equipment and typical crew (5 men). Two men in foreground are standing on protective shield. Shield protects workmen and others from being splattered with slurry caused by excessive pressure. Splattering confined to low level area as shown. Man behind is helper and cleanup man who removes any excess slurry

★ Showing material truck containing soil and cement ready for charging mud-jack hopper. In front of mud-jack stands emulsion supply tank. Truck at extreme right is water tank

# P&H Single Pass

## PROCESSING 3,000 LINEAR FEET PER DAY

### *cuts the cost of road building*

Here, in Mississippi, as in many other states, the P&H Single Pass Soil Stabilizer is setting up new standards in producing good, all-weather roads more quickly — and at lower cost.

This 10½ mile stretch of road, 22 feet wide and processed to a depth of 6 inches, was completed in only 21 working days.

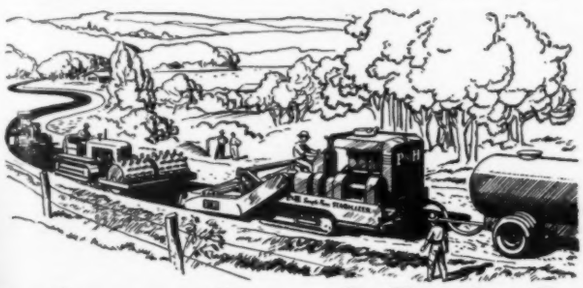
Maximum utilization of native, in-place soils reduced the need for importing foreign materials, thus reducing materials costs to a minimum.

With the complete processing accomplished by the P&H Stabilizer, the only auxiliary equipment required included a disc type plow, one sheep's foot roller and tractor, rubber tire roller and one motor grader.

Accurate control of all factors such as uniform processing depth, thorough pulverization, accurate proportioning and blending, including liquid etc., made it possible to meet specifications exactly and produce a road of predetermined load carrying capacity. Complete information is available on request.

# Soil Stabilizers

## *Another example of* P&H *Speed and Efficiency*



### THESE ARE THE FACTS ABOUT THE JOB

Location of project — Highway 19, Lauderdale County, Mississippi — from Alabama line to Vimville.

Length of project — 10.48 miles.

Width of roadway — 22 feet.

Depth of treatment — 6 inches, compacted.

Type of soil — Natural soil of A-2 Classification with PI of 5 or less and Clay having PI of 19 Combined with sand to produce material of A-2 Classification.

Stabilizing agent — Asphalt — R.C.2 (4.32 gallons per square yard equal to 7% by weight of dry soil).

Rate of production — Approximately 3,000 linear feet per day.

Traffic was maintained through this road during construction.

## *Performs these 8 Basic Requirements in a Single Pass*

Here again, the P&H machine proved its ability to fulfill these 8 basic requirements of soil stabilization with definitely predetermined results.

1. Control processing depth for accurate proportioning.
2. Pulverize the soil thoroughly.
3. Blend materials uniformly.
4. Create a true sub-grade.
5. Disperse the liquid through the entire volume in measured quantity.
6. Mix the coated material uniformly.
7. Lay the completely processed material in a fluffy, even depth, ready for compaction.
8. Do all these things in one pass—at a good rate of speed.

The P&H Single Pass Soil Stabilizer is capable of handling any type of admixture. If you are considering the construction of base courses, secondary roads, airport runways, etc., investigate the performance of the P&H Single Pass Stabilizer under conditions similar to your own. Ask for the facts.

P&H

**SINGLE PASS STABILIZER**

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Milwaukee 14, Wis.

**HARNISCHFEGER CORPORATION**

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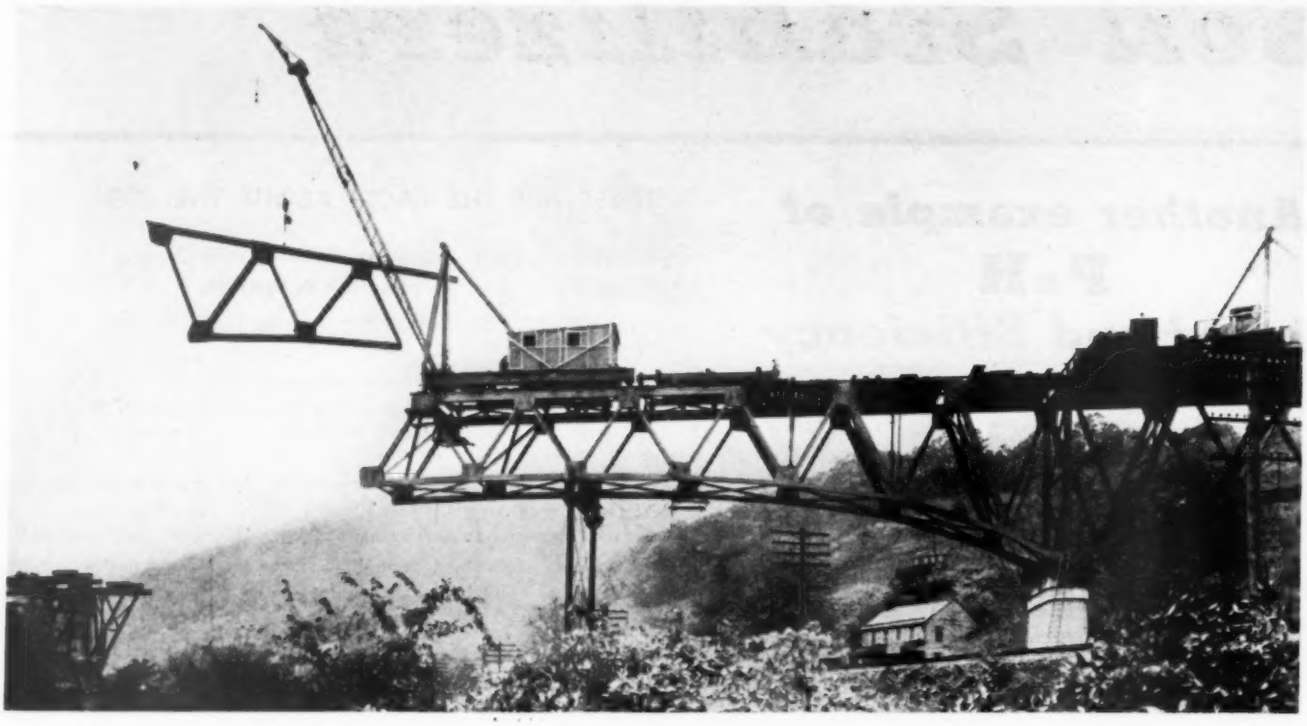


★ Erection was cantilevered forward from one end, using a traveler. False-work bent in position for second span

## Historic Harpers Ferry Spanned Again

# 2247-Ft. Continuous Truss Bridge

- **Bethlehem Steel Co. completes superstructure for $1,150,-000 highway bridge at Sandy Hook, Maryland, using traveler and cantilever methods**
- **Deck of unusual integral design Pumpcreted by McLean Contracting Company under subcontract**
- **Substructure job by James McGraw Company in 1941-43 hampered by floods and war shortages**


***By Walter C. Hopkins***

Deputy Chief Engineer, Maryland State Roads Commission, Baltimore


THE opening to traffic recently of the Maryland state roads commission's latest major bridge, over the Potomac at Sandy Hook, tempts us to pause and philosophize a bit over bridges and bridge engineering in general. But, we'll get on to a practical high-lighting of this bridge's design and construction, pausing here merely to note that bridge engineering is still an art beyond the handbooks, and that every rampaging river is a perpetual challenge to the designer and the builder.

In the design of this bridge, primary attention was given to providing a structure above and beyond the effect of any recorded flood and at the same time obtaining an economical, as well as architecturally pleasing bridge. These considerations resulted in the adoption of a continuous multiple span steel deck truss superstructure, supported on concrete piers and abutments. The pleasing arch appearance of the superstructure is entirely consistent with the proper proportions for the continuous design.

The superstructure comprises four continuous units of 3 spans each, plus a simple I-beam span at each abutment. The two units in midchannel each consist of three 190-ft. spans. The two units toward either shore each comprise a 114-ft., a 190-ft. and a 190-ft. span in an unsymmetrical system. The continuous units thus are 494—570—570—494-ft. The 46 and 67 ft. I-beam end spans bring the total length to 2247 ft. between abutments.

Trusses are spaced 18 ft. c. to. c. Truss depth c. to. c. chords varies from 32 ft. over piers to 15 ft. at midspan.

An unusual feature of design is the use of spiral steel rods welded to tops of stringers, effecting a "composite design" of stringers and deck slab. Such construction provides additional stiffness to the entire structure and also acts as a secondary system of bracing to resist wind stresses. Stiffness is especially desirable due to the wind-swept valley location. The composite system also permitted lighter stringers, with resulting saving in steel throughout.

### Some Silicon Members

Silicon steel sections were used for certain chord and web members to

maintain a more uniform size, as well as to provide wider selection for the members. Many members were made heavier in order to withstand cantilever erection stresses, and some were changed to silicon steel for this reason.

Reactions were weighed by use of proving rings to assure that design reactions were obtained at every bearing. See details farther on in article.

Sidewalks at roadway level are separated by white cement reflector-type barrier curbs. By thus building the walk lower than is customary with a traditional curb, the handrail is brought lower and better visibility afforded vehicle passengers. The reflector design was adopted to obviate electric lighting, although provision is made for future lighting. The handrail is of an ornamental type in keeping with the Gothic architecture used throughout. Horizontal members are structural steel, with malleable iron posts and pickets, affording the maximum of openings as well as great strength.

Roadway expansion joints between the continuous truss units are interlocking finger-type, made of malleable iron castings. Expansion in the railings is accomplished by sliding a section of railing inside of a post at either side of the joint and stabilizing the movement of the railing with helical springs. The type of expansion joint provided can move nearly 7 in. from min. to max.

### Footings Check Drilled

Piers are of concrete, founded on rock. Pier ends are rounded to multiple-radius curves and the sides have depressed panels of Gothic architectural shape. Reinforcing is proportioned to resist stresses from all possible combinations of forces, including quartering winds. Most main river piers have a footing width of 16′-6″. The width of shaft at bottom of coping or cap is 6 ft. Sides and ends below coping are battered ½ in. per ft. The cap width is 7′-6″.

At the Maryland abutment, retaining walls are flared and the contained fill considerably widened to provide a parking area and observation platform for motorists.

The structure is designed for 20-ton trucks. The lowest point of the steel superstructure is 36 ft. above normal water surface. (During the record March, 1936, flood the crest reached a height of 30 ft. above normal water, or 6 ft. below the min. clearance.) These new geometrics indicate very clearly the inadequate dimensions of the old Bollman bridge (1852-1936) which was only 852 ft. long and 24 ft. above normal water. The old bridge also contained an extremely narrow roadway due to its original function as a single track railroad structure.

### Principal Quantities

The substructure involved 4,500 c.y. of excavation, more than 6,000 c.y. of concrete and 239 tons of reinforcing bars. The superstructure consumed more than 2,000 c.y. of concrete, 250 tons of reinforcing steel, 350 tons of silicon and 1,700 tons of carbon structural steel.

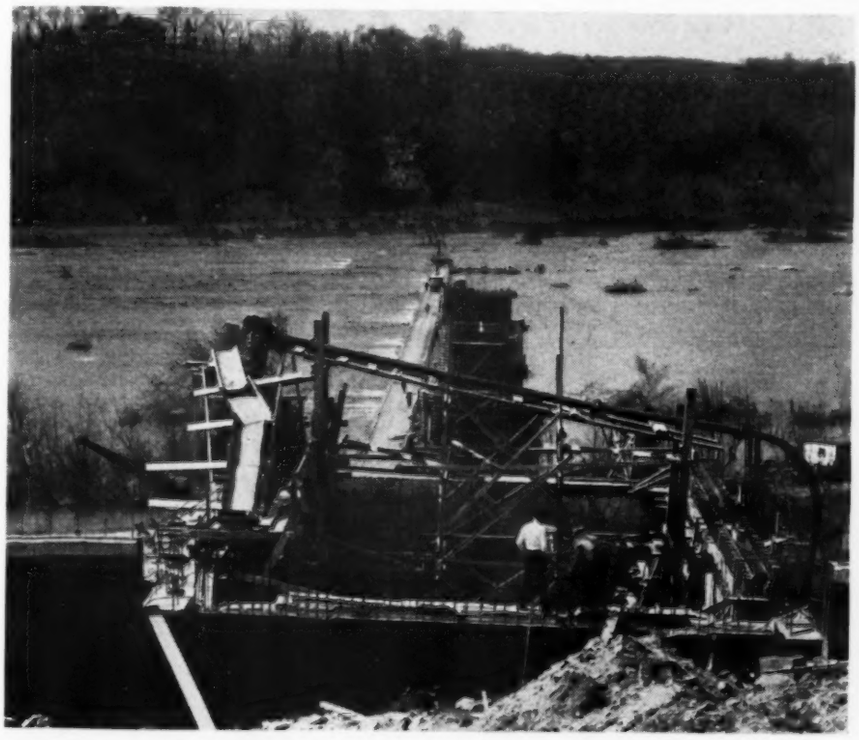
### Floods Beset McGraw Co.

So much for the design. The construction story began with the contracting of the substructure in September, 1941, by the James McGraw Company of Philadelphia. All work was performed from a temporary low-level construction trestle, using a 160 double Pumpcrete machine with pugmill remixer, served from weigh bins and batcher plant. Open cofferdams consisting of double lines of timber sheeting acting as puddle walls were employed. Setting and handling operations as well as excavations were performed by one or two crawler cranes.

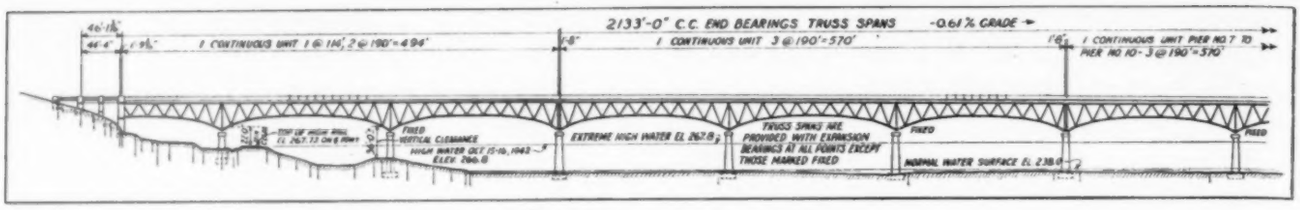
Trestles and cofferdams were among the flood casualties. Handheld compressed air drills were used for check drilling into foundation rock, specified for a depth of 10 ft. in order to verify the continuity of the rock. Muck and sand were clamshelled.

High water bedeviled the contractor during 1942, sudden swelling in the Potomac causing loss of lumber, machinery and equipment. Due to floods the operating base was moved from the Maryland to the Virginia side. Although their $270,000 contract was scheduled for completion in 256 working days, an elapsed time of 18 months was required, due in

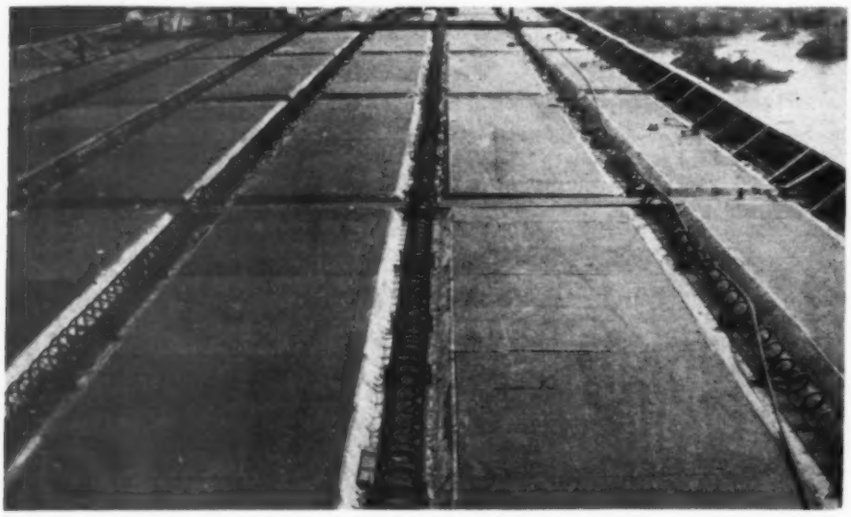
★ Feb. 13, 1942. First pour of pier 4 (James McGraw Co.)



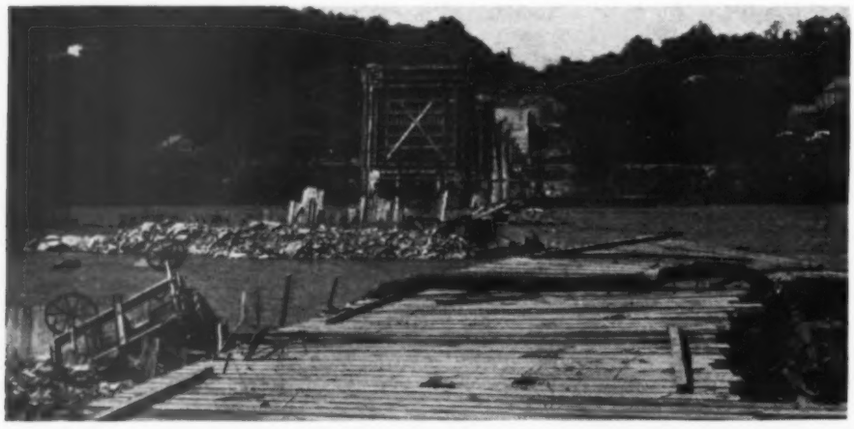
★ April 15, 1942. Ready for final pour on near abutment and framing in progress on pier 8


2133'-0" C.C. END BEARINGS TRUSS SPANS -0.61% GRADE
1 CONTINUOUS UNIT 1 @ 114', 2 @ 190' = 494'
1 CONTINUOUS UNIT 3 @ 190' = 570'
1 CONTINUOUS UNIT PIER NO. 7 TO PIER NO. 10 - 3 @ 190' = 570'
FIXED
VERTICAL CLEARANCE
HIGH WATER OCT. 15-16, 1942
ELEV. 266.8
EXTREME HIGH WATER EL. 267.8
TRUSS SPANS ARE PROVIDED WITH EXPANSION BEARINGS AT ALL POINTS EXCEPT THOSE MARKED FIXED
FIXED
FIXED
NORMAL WATER SURFACE EL. 238.0

★ Elevation showing principal dimensions and location of the four 3-span continuous units



★ Because of minor variations in depth of drop panels surrounding the helical reinforcing, form panels could not be re-used. Here forms are in place throughout a 3-span unit



★ June 3, 1942, after repeated floods. Showing start of replacement of wrecked trestle and details of pier shaft forms

part to material and labor difficulties.

## Bethlehem Delayed

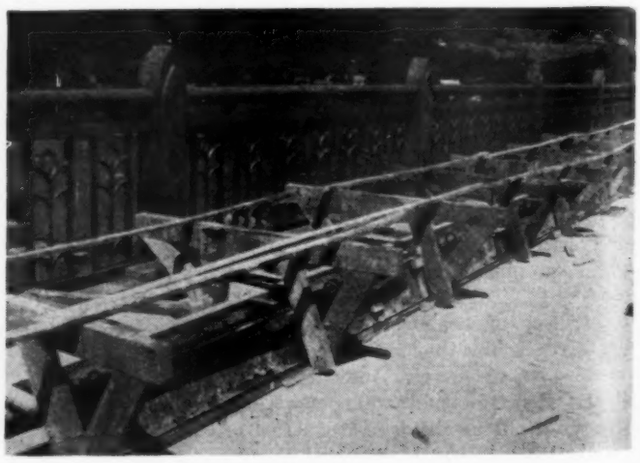
The superstructure was awarded in Nov., 1945, to Bethlehem Steel Company, but postwar shortages and unsettled labor conditions forced postponement of starting until Sept., 1946. Once mobilized, however, the erection work was completed through the 1946-47 winter and spring, using a stiff-leg traveler for progressive cantilever erection from the Maryland side with temporary top chord connection between structural units.

Steel falsework bents were necessary only for the first and second truss spans, being needed for the second because the first was considered insufficient anchorage for cantilevering.

## Proving Ring Method

Because of the indeterminate characteristics of the three 3-span continuous span units, it was considered advisable to weigh pier reactions and adjust heights of end shoes for each unit, in order to assure that actual reactions conformed closely to theoretical. Bethlehem's contract included a lump sum item for furnishing and operating necessary proving rings under engineer direction. This work was subcontracted to the Fritz Engineering Laboratory of Lehigh University.

★ Six-inch Pumpcrete line for concreting deck



★ Forms in place for reflector-type curb

whose personnel worked closely with the Maryland engineers to carry out the procedure.

The term "proving ring" refers to a closed steel ring or hoop, equipped with a micrometer gauge sensitive enough to measure the very small deflection or deformation of the ring caused by the full dead load. Deflections were calibrated against loads.

All shoes at end supports were fitted with an extra 1 in. thickness of shims, to permit adjustment of shoe height when found necessary to equalize and correct the final reactions. On completion of a 3-span system, the procedure was to jack up the ends, set a single ring or pair of rings in place under each chord, and take deflection measurements.

The ideal method would have been to set rings simultaneously under all four end corners of a 3-span unit. But sufficient rings weren't available, so that procedure was to weigh and adjust one pair of ends at a time, alternating back and forth with shim adjustments until all end reactions were equalized to within the allowable limits. Hand-operated screw jacks were used.

Paired reaction measurements for equal shoe heights at a given end showed the importance of making final adjustment. For even the most painstaking fabrication cannot eliminate inequalities. Actually only a small fraction of an inch inequality in shimming was necessary to equalize the reactions, and a few 1/16-in. shims, more or less, did the work in all cases. Jacks were operated directly through the rings, a procedure adopted after trial use of rings in a position alongside the jacks.

It is interesting to note that the finger-type roadway expansion joint plates were also designed with extra shim space, so that height could be corrected to match the shoe shims.

## Deck Also Pumped

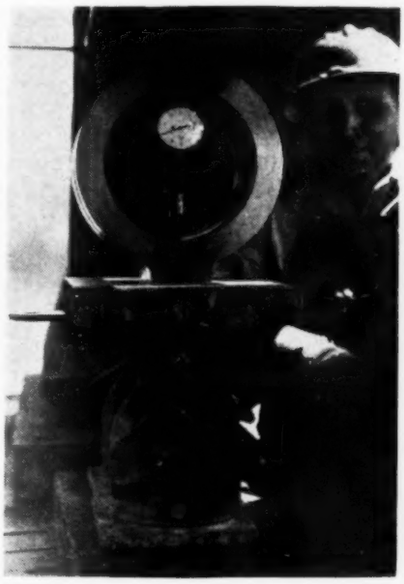
Deck and concrete handrail work was sublet to McLean Contracting Company, of Baltimore, which completed its work between May 1 and Oct. 15, 1947, despite a 3-week shutdown during a supplier strike. Power equipment was prohibited in order to minimize the construction load and thus control girder deflection. This meant carrying and setting forms and reinforcing steel by hand. For this reason and because the entire half-mile of deck had to be built from one end, the contractor found it especially advantageous to pump in the concrete. A 6-in. Pumpcrete line was employed, working from a single 15-c.y.-per-hr. pumping unit located on the Maryland side. Concrete was batched at a rail siding and hauled to the job in 2-yd. transit mixers.

Deck concreting proceeded in 38-ft. sections (two panels), cast in a specified sequence which assured approximate balance of deck weight at all times. The 38-ft. pour was selected as the largest that could be easily finished in a single day. The rather small Pumpcrete capacity proved ample, since the daily pour was only 35 c.y.

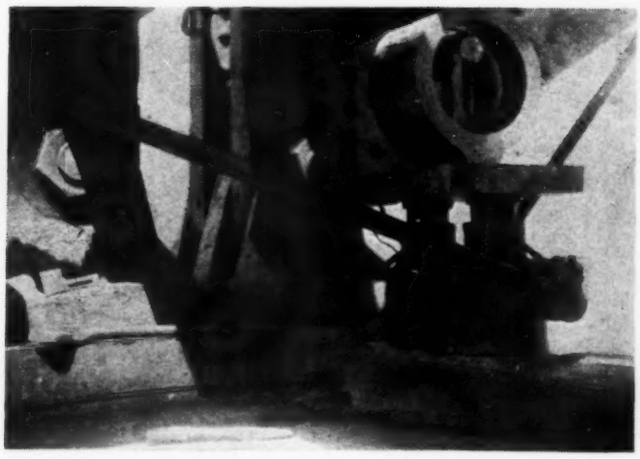
★ The new bridge is higher, wider, longer and heavier than earlier bridges —denoting advancement in bridge engineering

## Form Complications

Form panels consisted of ¾-in. plywood sheathing braced with 2 x 4 studs and 2 x 6 walers, suspended from the steel stringers by screw anchor hangers.



★ How proving rings and hand-operated jacks were set to weigh and equalize dead load at end supports of each 3-span unit



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You're sure of more durable concrete when you use Atlas Duraplastic air-entraining portland cement . . . and paving concrete is rendered highly resistant to scaling action of de-icing salts.

## Minimizes segregation and bleeding

Less mixing water is required for a given slump. Duraplastic mix is more workable, more plastic, more cohesive and more uniform throughout.

## And costs no more than regular cement

Duraplastic calls for no additional materials or unusual changes in method. Complies with ASTM and Federal specifications and sells at the same price as regular cement.

**Duraplastic provides** the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance. Send for further information. Write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

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TRADE MARK REG. U. A. C. CO.

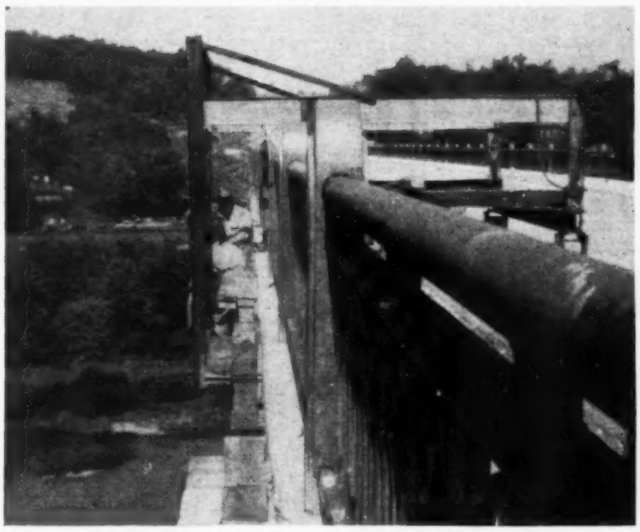
*AIR-ENTRAINING PORTLAND CEMENT*

**MAKES BETTER CONCRETE AT NO EXTRA COST**

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—ABC Network*

★ Completed curb. Note also iron handrail of ornamental design

★ Gothic pilasters set the architectural feeling



★ How walkway under deck was supported for stripping forms. Pair of posts, hung from cantilever beams riding casters as shown here, was provided outside each parapet as means of supporting cables and plankway

While form panels were approximately similar, they could not be reused due to slight variations in depth between the slab surface and top of stringers, necessitating special forming of the "T" or drop sections for each panel. Hence it was necessary to cut, assemble and place forms for virtually an entire 3-span unit in each case. Two longitudinal lines of panels were placed clear through the three spans at the start, to serve as a walkway.

Stripping of forms was also a problem. This was accomplished from a movable suspended platform, consisting of planks carried on steel cables stretched transversely under the deck between steel posts which in turn were suspended from cantilever beams riding the roadway surface on casters.

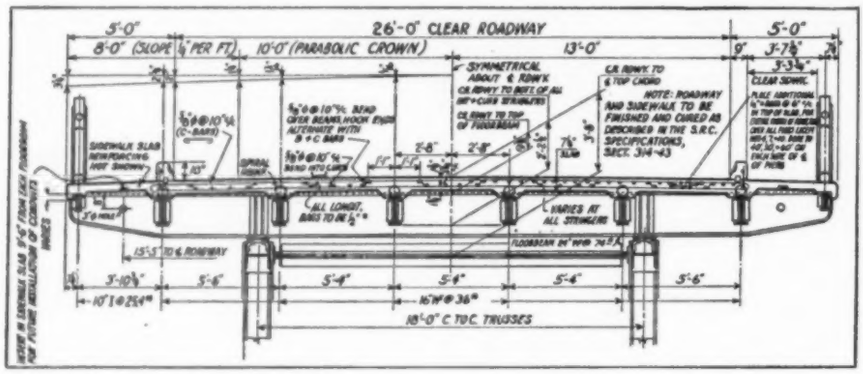
## White Cement Curbs

The barrier curbs heretofore noted were cast in place, using white portland cement, white stone and white sand. The reflector design was formed with patented (Fraupel) forms

★ Bridge completed except for part of hand rail—note pleasing architectural treatment

★ Showing details of helical reinforcement welded to stringer tops

★ Reinforcing had to be carried over the bridge by hand because power machinery caused excessive girder deflection




★ Cross-section of floor, which is of unusual composite design

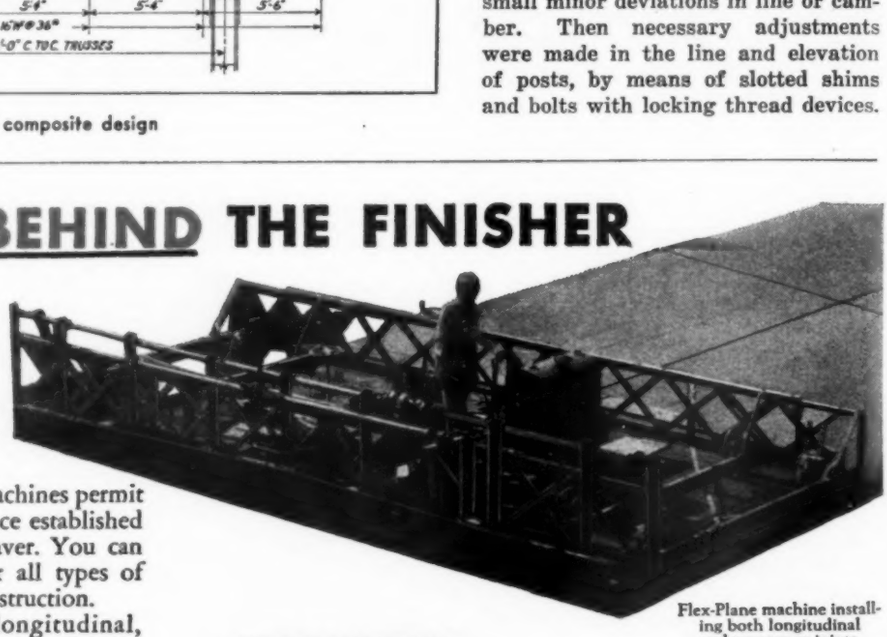
rented for the job. Setting the hand railing involved some extra niceties to insure perfect alignment horizontally and transversely. Posts were not set until the slab and curb had been completed entirely across the bridge; temporary 2-ft. slots were left in the parapet until final positioning of posts. Transit and level lines were then run across the bridge to detect small minor deviations in line or camber. Then necessary adjustments were made in the line and elevation of posts, by means of slotted shims and bolts with locking thread devices.


# MECHANIZE BEHIND THE FINISHER

POURED—Flex-Plane furnishes moulding strips (V Plates) to meet any specification.

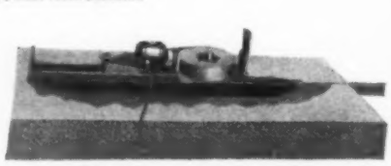
RIBBON—furnished in 1/8" or 1/16" width for any specified depth.

PREMOULDED—makes installation easier. Premoulded material available from Flex-Plane.



Flex-Plane machine installing both longitudinal and transverse joints.

Flex-Plane joint machines permit you to keep the pace established by the modern paver. You can use Flex-Plane for all types of dummy joint construction. Dummy joints, longitudinal, transverse or both, can be installed speedily, easily and economically with the Flex-Plane joint machine.



VIBRATED INSERT DRAG—for longitudinal joints. Ribbon material being automatically installed in this case.

VIBRATED TRANSVERSE CUTTER—for half width construction.

**FLEX-PLANE machines are available for sale or rental**

**CLIP THIS COUPON NOW!**

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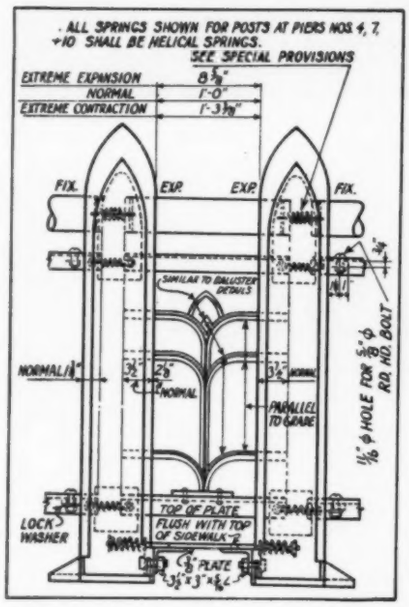
**Mail to FLEX-PLANE, Warren, Ohio**




★ Hand rail post design included helical springs and other refinements at expansion points

### Cooperative Project

The new Sandy Hook bridge cost approximately $1,146,402 including $3,524 for R/W, $292,878 for substructure and $850,000 for superstructure. In financing, the cost of the structure was distributed as follows: Maryland, $550,002; Virginia, $105,400; Federal Aid, $491,000. The state roads commission of Maryland designed and supervised the bridge in its entirely. Prior to the design, Virginia and W. Virginia highway departments and Public Roads Administration engineers met with the Maryland staff and approved the location, width of roadway and other general details. An Act of Congress was introduced authorizing a new free bridge. This was passed and approved by the President March 19, 1941. A War Department Instrument of Approval was approved by direction of the Under-Secretary of War June 26, 1941, and the necessary interstate agreements executed during this period when plans were being prepared. Federal Aid participation in the cost was requested and obtained. Since the new bridge crosses the Baltimore and Ohio Railroad and the Chesapeake and Ohio Canal, it was necessary also to prepare and execute agreements with the Railroad Company and the Department of Interior, which latter named agency had by that time assumed control of the canal.

Allen Lee was principal design engineer for the project. Robert M. Reindollar is chairman of the Maryland state roads commission.


# HELTZEL BINS

When you think of bins you think of Heltzel Bins. That's natural because your experience and the testimony of all bin users have proved that Heltzel's concentrated engineering in concrete equipment has brought about practical developments that pay off in durability, versatility and trouble-free operation. We're proud of the demand for Heltzel bins and batchers and we're sorry we can't ship orders at a normal rate. We're doing the best material supply will permit. We know you want the best and will be patient and make your old equipment do until you can install a Heltzel.

Heltzel
BUILDS IT BETTER

- BINS, Portable and Stationary
- CEMENT BINS, Portable and Stationary
- CENTRAL MIXING PLANTS
- BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
- ROAD FORMS (with lip curb and integral curb attachments)
- CURB FORMS
- CURB AND GUTTER FORMS
- SIDEWALK FORMS
- CONCRETE BUCKETS
- TOOL BOXES
- FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

# Roller Bearing Maintenance

**II—What your shopmen should know about roller bearing installation, replacement, etc. Continuing data published by permission from the Hyatt Roller Bearing Handbook**

### Bearing Damage

Almost all damage occurring to roller bearings is the result of one of two things; improper handling while installing or removing bearings or improper operating conditions. Some of the most common forms of damage caused by incorrect practices while installing or removing bearings include:

**Brinelling**—Brinelling appears as a series of nicks or indentations under each roller and occurs whenever bearings are installed or removed in such a manner that the driving force travels through the rollers instead of being applied directly to the press-fitted race. Brinelling may also be caused by hammer blows or by the application of sudden or excessive loads.

**Splitting**—Race splitting is caused by mounting bearings on shafts which have diameters larger than specified, thus causing excessive press fit stresses. It may also occur from cocking the race while installing or removing it. Splitting may not occur immediately after such mishandling, but may occur after a short period of operation.

**Scoring**—Scoring may occur on rollers or races and is caused by dragging the roller assembly across the surface of the races in a cocked position or with a heavy load on the bearing. Although scoring may look harmless, it will cause noisy bearing operation and will eventually lead to pitting.

These forms of damage are the most common occurring in the operation of roller bearings. With the exception of pitting, these and the forms of damage caused by improper installation can all be minimized or avoided by observing the suggestions outlined in this article. Usually, the occurrence of any of these six forms of damage is sufficient cause for scrapping the bearing affected.

**Pitting**—Pitting is a form of damage which cannot always be avoided as it will eventually occur in any bearing which has operated beyond its expected life. However, there are many factors which tend to hasten pitting such as nicking, scoring, brinelling, or indenting, or the operation of bearings with excessive loads and speeds.

**Indenting**—Indenting is a form of damage to bearing parts which results from the presence of foreign particles such as dirt, chips or carbonized lubricants. These substances become wedged between rollers and races and are pressed into the surface, and early pitting will usually follow. This damage is the best argument for cleanliness in handling bearings. Indenting of one bearing part may also be an indication of pitting of some other part of that bearing.

**False Brinelling**—False brinelling resembles true brinelling very closely in appearance, but comes from entirely different causes. Bearings which are subject to vibration or which oscillate through a small arc instead of revolving, will show false brinelling. It is very difficult to eliminate, but the removal of vibration or the use of a lubricant of low viscosity may prove effective.

Proper bearing installation will give your bearings added life.

### Bearing Seat Finishes

The bearing seats of factory-made shafts are always finished to a high degree of accuracy and smoothness. Replacement or repaired shafts should also have the same kind of treatment. A roughly ground bearing seat will have the tops of the grinding ridges peened down and will cause looseness after the bearing has been operating a short time. Hand finishing with emery or crocus cloth should be done very carefully to avoid high and low spots or taper. Chatter on the bearing seat will transfer to the operating surface of the inner race and will produce noisy bearings. Remove all burrs and sharp corners from shaft ends over which races must pass.

### Fits and Tolerances

A careful measurement of the bearing seat diameter should be made in all cases where there is any sign of wear or where the shaft has been ground or plated. This diameter must fall within the limits set by the bearing manufacturer, as a loose fit will permit the bearing to move axially on the shaft, and an extra-tight fit may crack the race. The recommended shaft sizes can be had from bearing catalogues or from bearing distributors. Make sure that the micrometer used for finding dimensions is accurate.

### Cleaning Bearing Seat

Before pressing a bearing back on the shaft, the bearing seat should be thoroughly cleaned of all dirt, carbonized lubricant or any other foreign matter present. Not only may such things cause scoring of the shaft and the bearing bore, but an improper bearing installation may result. Dirt on the shaft may move ahead as the bearing is pressed on the shaft, and pack between the inner race and shaft shoulder. This in itself results in an improper adjustment. If the dirt is later washed loose, the end thrust on the bearing may cause a sideways movement of the shaft which might cause misalignment of other machine parts.

### Lubrication of Bearing Seat

After the bearing seat and the bearing bore have been cleaned, they

should be coated with some lubricant. This not only aids in pressing on the bearing but helps to prevent the formation of rust at the press fit, and also assists in any later removal of the bearing. Any type of oil or grease is helpful, but best results have been obtained with lubricants containing graphite, zinc or lead.

### Cleaning, Painting Housing

Before replacing a bearing in its housing, make sure that the housing is free from dirt, dust or metal chips. The same kind of solvents used in cleaning the bearings may be used for cleaning the housing, with the same precautions being taken to insure a clean bearing location. It is a good idea to paint the insides of housings, especially when new, to prevent rusting and, in the case of cast iron, to seal in any loose sand or other particles. Quick-drying paint or enamel which will stand up under heat and oil should be used.

### Bearing Installation

**Pressing Through Races**—The pressure required to drive bearings on shafts or into housings must be applied through the races. Where bearings or bearing parts are assembled on shafts, apply the pressure to the face of the inner race. Where bearings or bearing parts are assembled in housings, apply pressure to the face of the outer race. If the pressure is directed through the wrong race or against the rollers, cage or snap rings, injury in the form of brinelling, bending or fracture will result.

**Pressing Straight and Square**—The pressure, as well as going through the proper race should be directed *straight* and *square*. This means that the pressure should be distributed as uniformly as possible over the entire face of the race. Concentrating the load on one side of the race will cause cocking and will result in scoring the shaft or splitting the race. The pressure should be directed straight down as a force applied at an angle may result in damage to the shaft or to the bearing separator or grease seal.

**Use of Hammers**—Hammers or mallets must never be used by themselves to drive bearings or bearing parts. Hammering directly against races is, perhaps, the surest way of injuring the bearing because it produces brinelling, race cracking, or damage to the cage and snap rings. In addition there is a great deal of danger present for the operator, since the hard bearing race may splinter when hammered, with possible injury to the eyes or face.

**Drive Blocks**—Drive blocks furnish one of the most convenient means of driving a bearing on a shaft or into a housing. They are simple to construct and are especially useful in production assembly or where the operation is repeated time after time. Drive blocks can be used for either outer race, inner race or complete bearing assembly. They must be so constructed, however, that the pressure travels only through the press-fitted race, and that the race is brought up snug against the shoulder or other means of retainment provided for it.

**Pipe or Tubing**—Pipes or tubes can be used to assemble races or bearings in the same manner that they are used to remove them. Besides, pipe or tubing can be used in conjunction with an arbor press as well as with a hammer. The pressure should be distributed over the end of the tube by means of a steel block or cap.

**Bearing Pullers**—Certain types of bearing pullers can be used to drive inner races on shafts. It is used with a split collar placed behind the bearing to distribute the pressure evenly over the bearing face and to carry the pressure through the inner race, rather than through the outer race and rollers. The use of such devices is limited to inner race mountings as no convenient system of using bearing pullers has been devised for outer race installations.

**The Arbor Press**—The arbor press provides one of the best means of mounting bearings and races, for its action is rapid and pressure can be applied continuously. Special precaution should be taken when using the arbor press to align the race squarely on the shaft, as the great pressures which can be exerted by the press could easily cause race cracking or severe scoring of the shaft, if the race were started off square. Accessory equipment such as drive plates, tubing or pipes which will carry the force through the press fitted race, should be used whenever necessary.

### Race Expansion

**Hot Oil for Expanding Races**—Bearing inner races may be heated to expand the bore, thus making them easier to assemble on shafts. This practice is followed most often where very large bearings are to be installed, as heavy and expensive equipment would otherwise be necessary. One method of transferring heat to bearings is through the medium of hot oil. The bearings should never be placed on the bottom of a tank, but should be suspended in the oil by hooks or laid on a screen, so that they may be heated uniformly and be free from sludge or dirt which will accumulate at the bottom of the tank. A light or medium grade lubricating oil is used and the temperature of the oil must never exceed 300° F.

**Electric Lamps for Expanding Races**—A simple method of expanding roller bearing races utilizes the heat generated by incandescent light bulbs. A shelf-like structure is arranged so that when the bearing rests on it, the inner race bore surrounds the large section of the bulb. The burning lamp heats up the race, expanding it, while permitting the outer race to remain cool for convenient handling.

Where large quantities of bearings are to be heated for assembly purposes, infra-red lamps are used. The bearings are placed on a shelf between batteries of infra-red lamps and reflectors, and are moved along the shelf regularly, or are permitted to remain there until the required temperature is reached.

**Hot Air for Expanding Races**—Air may be used instead of oil as the medium of transferring heat to the bearing. This is done by heating in a small electric furnace or in a muffle type gas fired furnace. When being heated by hot air, service bearings may be retained in their original cartons. In this manner, the bearings are kept fully protected from dirt until actually ready for installation. The temperature of the air in the furnace should *never exceed 300°F.*

### Closures and Seals

The closure or seal used at the shaft opening should be inspected each time a bearing is serviced or replaced. Seals are designed to serve two purposes: to keep the lubricant in and to keep dirt out. They should be replaced by new seals when an examination shows that they are failing to function properly in either respect.

There are a great many types of seals, each designed for a different kind of application. One of the most common is a simple felt ring. Because they are cheap, these rings can be replaced each time the machine is overhauled. They should be replaced oftener if they show evidence of wear, scuffing or of becoming brittle. The one piece stamped ring type is preferable to the split rim type. If the method of installation requires that a split rim washer be used, a single cut, on the bias, should be made, and care should be taken that the joint is closed properly and the washer assembled without distortion. Felt seals should be soaked in oil until thoroughly impregnated before they are installed.

*Concluding portion of this summary to be published in April Roads and Streets*

# New Construction Equipment and Materials

## 1

## New Sump Pump

Designed to overcome one of the most common causes of pump failure —breaking of the pump shaft seal because of water pressure—a new sump pump, known as the VP-4 has been announced by the Gardner-Denver Co., Quincy, Ill. The design of the VP-4 embodies a new principle —"top suction." It is stated that because of this feature the oil seal of the VP-4 is subjected only to static pressure from depth of immersion

VP-4 Sump Pump

when the pump is not in operation. When the pump operates, water cannot reach the oil seal on air motor. The VP-4 sump pump is operated by a powerful vane-type air motor. The pump impeller of the closed type is made of exceptionally hard, abrasion resistant alloy. A built-in oiler lubricates all moving parts of the pump with oil, the oil chamber having 1-qt. capacity for 24 hours' normal operation.

## 2

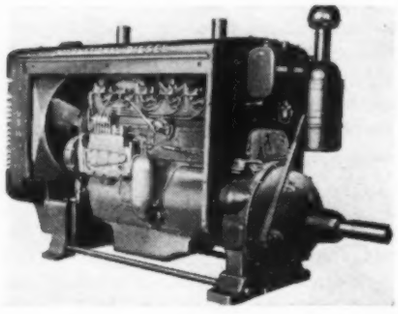
## New Hot Water Heater

A new compact hot water heater ruggedly and modernly constructed to assure contractors up to 200 gal. at 180° F. per hour, has been announced by Rempe Co., Chicago, Ill. The heater can be used to heat compressed air. It is simply and solidly constructed for dependable service in all weather. Shell of 14 gauge steel, is seamwelded. Coil of 1 in. steel pipe, one length, 90 ft. long. Outlet and inlet 1 in. I.P.S. thread to match ¾ in. hose thread. Both coil and cast iron grate are removable. A noteworthy feature is the large clearance between coil and grate which permits spread of fire bed. Heater burns coal, coke, wood, or any burnable refuse.

## 3

## New Diesel Engine

The International Harvester Co.'s second new Diesel engine to be announced this year, the 6-cylinder, 100-h.p. UD-16, is now in quantity production. This has a 501-cu. in. piston displacement and 4.4 x 5.5-in. bore and stroke. The engine develops 103 h.p. at 1,800 r.p.m. and, when equipped with radiator, fan clutch, and power take-off, delivers 100 h. p. at 1,800 r.p.m. The bore and stroke of this 6-cylinder engine and of the 4-cylinder UD-9 are identical. Engine specifications include: inbuilt gasoline conversion starting system; hardened replaceable cylinder sleeves; precision main and connecting-rod bearings; induction-hardened bearing journals on a seven-bearing crankshaft; four-cycle, valve-in-head design; full-pressure lubrication; aluminum alloy pistons; large flywheel; single-orifice injection nozzles; and a flyball type governor which maintains selected engine speed within the engine speed range. Since the UD-16 is a precombustion chamber type of diesel smooth idling and maximum power with clean exhaust result in a wide variety of low-cost fuels, including No. 3 fuel oil. The use of the new twin-plunger injection pump of IH design assures uniform fuel injection, equal power from all of the six cylinders, and minimum fuel consumption. Efficient engine cooling is attained through use of the forced-circulation type of cooling system, bypass thermostatic control, large full-length water jackets, and dual water manifold. Cooling and combustion characteristics are such that only ordinary lubricating oil is required.



Left Rear View of UD-16 Power Unit

## 4

## New 4-Wheel Scrapers

A new line of 4-wheel scrapers which eliminate restricting overhead cables and operating mechanism is now in full production by The Heil Co., Milwaukee, Wis. Exhaustive tests have been successfully conducted with 6, 9, 11, 16, and 25 yd. models. The open top feature of the new Heil scrapers is claimed to give them a lower center of gravity for greater stability, to improve operator's vision for loading and spreading, to permit maximum heaped loads, and to make it possible to load with a shovel or dragline bucket for straight hauling operations. The tilting floor of Heil twin cable scrapers is hinged just

New Heil Scraper on Construction Job Near Weldon, N. C.

back of the cutting blade and raises to discharge the load cleanly by

sweeping the sides and back of the bowl. Cables and sheaves are located outside the bowl of the scraper away from the dirt. The large diameter sheaves have anti-friction bearings with dust seals. A newly designed, double drum Heil power control unit provides convenient and positive control for digging, hauling, dumping, spreading and finishing operations. Adapters are available for mounting the units on all standard makes of crawler tractors. Two wheel open top scrapers of the same general design are also available for use with the two-wheel, rubber tired Heiliner, a full traction, diesel powered tractor.

## 5

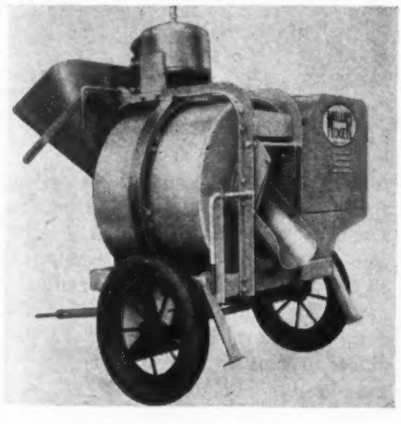
## New Hand Torch

A new hand torch for cutting stainless steel, using Airco's flux-injection process, has been announced by Air Reduction Sales Co., New York, N. Y. According to the manufacturer, this torch brings economical manual flame cutting of stainless steels within the scope of all types of mill and shop operations. The new torch, designed in its 21-inch length as Style 9016 is also available in a 36-in. length. Both lengths come with a 90° torch head. This torch, which was subjected to extensive field trial before it was put on the market is similar in many respects to the familiar Airco Series 9000 cutting torch.

## 6

## New 3½-S Mixer

A new 3½-S non-tilting concrete mixer has been introduced by Muller Machinery Co., Inc., Metuchen, N. J. The machine is carefully balanced for easy handling and is built along the same lines as a big mixer, having the same mixing action and fast discharge. The drum and drumheads are made of heavy steel plate and revolve on wide solid rubber rollers with guide rollers provided for holding true running location and preventing weaving of the drum. The machine is equipped with an automatic water tank which can be set for predetermined quantities of water for each batch. The drum is gear-driven and a heavy roller chain transmits the power from the engine to the counter shaft. For over-all rigidity, an angle iron frame for both hopper and discharge mechanism i provided. The complete unit weighs approximately 1,000 lb.



New 3½-S Concrete Mixer

## 7

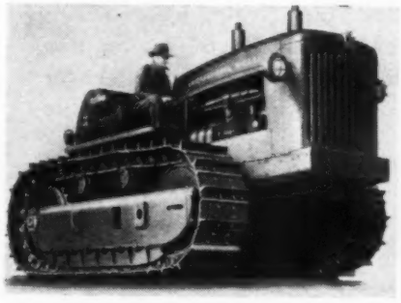
## Sprayer for Weed Control

A new all-purpose sprayer, developed by the Automatic Equipment Manufacturing Co., Pender, Neb., is a self-contained unit, tractor borne, featuring non-corrosive tank, boom and nozzles. It comes equipped with booms up to 40 ft. making possible widespread spraying.

## 8

## New Tractor

A new crawler tractor, International TD-24, now in production by International Harvester Co., Chicago, Ill., weighs 36,275 lb., not including fuel, water, attachments or dunnage. With fuel tank and radiator filled but without attachments the weight is 37,178 lb. The tractor has 180 hp. at the flywheel, 167 belt horsepower and 140 drawbar horsepower. The tractor is entirely new, including its 6-cylinder, 4-cycle, 180 hp. diesel engine. Among the features that are said to provide advantages in operation and power application are: Push-button all-weather starting with the International inbuilt gasoline conversion starting system. Tip-toe engine clutch control, hydraulically boosted. Eight speeds forward and eight speeds in reverse with a speed range from 1.6 to 7.8 m.p.h. Easy, on-the-go gear shifting by means of synchromesh transmission and instant high-low range shift. Quick forward-reverse shift in any traveling speed by means of separate shift lever. Planet-power steering under finger-tip control with new hydraulic system. This permits gradual turns with both track pulling or pivot turns with one track locked and the other track under full power.

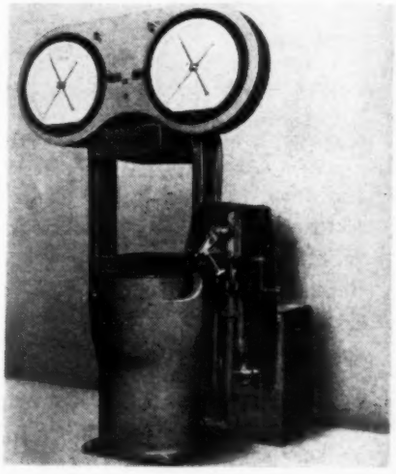


International TD-24 Tractor

## 9

## New Testing Machine

A new model Baldwin-Emery 300,000-lb. cement and concrete testing machine produced by Baldwin Locomotive Works, Philadelphia, Pa., features a 10-in. ram stroke and offers as optional equipment a spherically-seated rectangular compression head and bearing plate large enough to permit testing of concrete blocks 12 in. wide, 18 in. long and 8 in. high. Scribed concentric circles on the plate make it equally suitable for standard cylindrical specimens. Like earlier models the new machine meets ASTM requirements, and is adapted for use on construction projects, in field laboratories and in other laboratories where a low-priced, single-purpose machine is needed for inspection and control testing.



New Model Baldwin-Emery Testing Machine

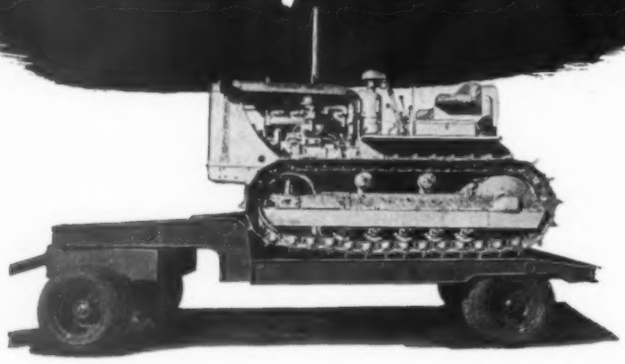
## 10

## New Brake Lining

A new wire molded brake material that is claimed to be non-warping and non-curling has been announced by the Raybestos Division of Raybestos-Manhattan, Inc., Bridgeport, Conn. The improved Raybestos wire molded lining has a harder, as well as an absolutely flat surface, which is claimed to give the material much greater wear resistance, flexibility and stability of friction. This is stated to make for less fade, less running drag, fewer adjustments and longer-lived quicker installations.

# LOW COST hauling

## *of loads up to 15 ton*



Light, versatile, easily maneuverable, this W-W 10-15 ton lowbed is available in either semi or full models. Oversize axles, scientifically designed frame, heavy duty pressed steel wheels, extra heavy brakes and other features contribute to the dependability and low cost operation of this light lowbed.

**4 sizes available.** The 10-15 tonner is available in four standard sizes. Bed widths are 8′ or 8′6″ with optional loading deck lengths of 8′ or 10′. Overall length of the semi trailer is 19′6″ and 27′3″ for the full trailer.

**Strong unitized construction** includes a gooseneck which is an integral part of the frame. Electrically welded into one solid unit, the scientifically engineered frame distributes the load over all frame members—reduces center point strain—assures a lowbed which can take reasonable overloads without weakening.

**Dual purpose trailer.** Full trailer can be converted to a semi by elimination of the front dolly assembly. Rugged 5th wheel plate with heat treated alloy steel king pin works equally well in semi or full trailer operation.

**IMMEDIATE DELIVERY** available on any standard 10-15; 20-35 or 40-60 ton models.

**Coupon** brings pictures, specifications on any type lowbed desired. Simply attach to your letter head and mail today.

## The WINTER-WEISS Co.

**2201 BLAKE STREET** **DENVER 2, COLORADO**

Gentlemen: Please send illustrated catalog on W-W lowbeds. We are particularly interested in a _____ ton model with loading deck length of_____feet between gooseneck and rear tires.

Firm Name_____

Address_____

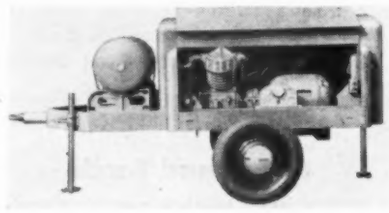
City_____Zone_____State_____

By_____Title_____


## 11

## New Portable Compressors

A new line of electric portable compressors in 60-105-160-210-315 c.f.m. capacities has been announced by Davey Compressor Co., Kent, O. Available in skid, 2-wheel trailer and 4-wheel trailer mountings the new units will be known as Air Chief "Electrics." They will serve as a companion line to Davey's 1948 gasoline and diesel models. Compressors are of two stage construction with



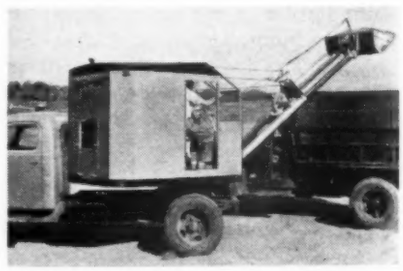
New Electric Compressor

inter-cooler and safety valve. They are direct driven from 1200 r.p.m., 220/440 volt A. C. motors of squirrel cage, horizontal type. Motor starters are full voltage, A. C. magnetic non-reversing, standard sheet steel NEMA Type 1, 3-phase, 60-cycle, with heaters for motor protection.

## 12

## New Scoop

A new full revolving, cable crowding scoop, announced by Quickway Truck Shovel Co., Denver, Colo., operates from all angles and digs and dumps in tight places. This scoop is available as a standard attachment for Model E and Model J "Quick-Way" truck shovels or as a complete unit in either size. The 4-ft. Model J scoop has a ⅜ cu. yd. capacity and the 5-ft. Model E gives a ⅝ cu. yd.



"Quick-Way" Scoop

capacity. Larger buckets are available for handling light material. The Model E scoop has a dumping radius of 6′ 11″ to 16′ 7″, dumping height of 3′ 7″ to 16′ 6″, and digging radius of 14′ 4″ to 19′ 5″. Model J ranges are: dumping radius, 6′ 1″ to 15′ 4″; dumping height 2′ 9″ to 14′ 5″; digging radius 12′ 6″ to 17′ 6″. The Scoop is interchangeable with other "Quick-Way" attachments.

## 13

## New Forms for Curb and Gutter

A new type of articulated flexible steel face forms for curb and gutter construction, announced by Blaw-Knox Co., Pittsburgh, Pa., is stated to simplify the work of forming a battered curb face and to accommodate any reasonable size radius. The new forms consist of straight, rigid sections one foot long, all identical. A 10-ft. length is made up of ten such sections and a 5-ft. length is made up

New Face Form

of five sections. The sections are assembled onto a steel cable, the cable passing through eyelets welded to the 1-ft. sections at both ends. Attached to one end of the cable is an I-bolt which ties to the outside eyelet of one of the end sections. The opposite end of the cable is simply anchored to the opposite end section with a cable clamp. For the back of the curb and for the face of the gutter, standard flexible steel forms are used and set in the usual manner. Each section of articulated flexible face form is keyed to a dividing plate after which the slack in the cable is taken up. The dividing plates are then given a final adjustment if necessary. The form sections being straight and rigid, the setting results in a series of short chords.

## 14

## New Portable Service Station

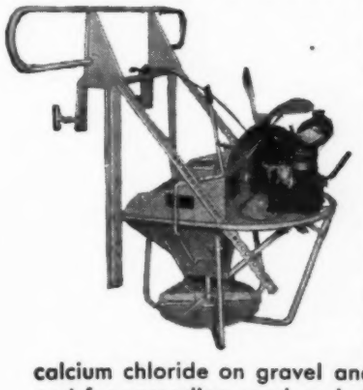
A mobile service station, stated to be capable of completely servicing mechanized units operating on heavy construction jobs, has been announced by Jax, Inc., Pittsburgh, Pa. Housed in a 21-ft., 4-wheel trailer, the new mobile service unit is 8 ft. 3 in. high, is safely under the highway maximum 96-in. width, and has a gross vehicle weight of 18,000 lb., more than 3½ tons of which is fuel and lubricant payload. Contained are 700 gal. of gasoline and diesel fuel, 200 gal. of different oils and greases, 60 gal. of water or antifreeze, quantities of kerosene, and compressed air for tires and other uses. Central portion of the machine is made up of the fuel

EASIER OPERATION . . .
FASTER.
MORE PROFITABLE
SPREADING WITH HIGHWAY SPREADERS

**The Hi-Way Model R Material Spreader with REVERSIBLE Transmission**

Put more profits into your pockets by saving time and material. Shift one lever and you can operate the Model R Spreader forward or backwards to suit the job. Spiral feed roller and agitator-conveyor have reversible transmissions assuring positive action and steady flow of material regardless of direction. Feed gate adjustment controls thickness of spread. Width can be adjusted from one foot to full width of spreader. Entire unit is balanced for easy hook-up to truck. Swivel type self-coupling hitch allows traction wheels to remain in constant contact with ground...assures even distribution on any job. Hi-Way Model R Material Spreaders are available in 8, 9, 10, 11, 12, and 13 foot widths. Write for complete details.

**Spreading is a ONE MAN job with the HIGHWAY MODEL DD**



This remarkable spreader clamps onto tailgate of any dump truck. Permits one man to cast a uniform spread 8 to 60 feet wide at truck speeds up to 35 miles per hour. The DD casts material close to ground under and ahead of rear wheels of truck. It is equipped with adjustable feed gates controlling thickness and direction of spread, and throttle on 1½ H. P. Briggs & Stratton gasoline engine to control width. Material feeds into hopper by gravity—no shoveling required. The Model DD is widely used for low cost seal coat work, for spreading calcium chloride on gravel and dirt roads for dust control in summer, and for spreading sand and cinders on highways, streets, and airports for ice control in winter. Write for specifications.

**HIGHWAY EQUIPMENT COMPANY, INC.**
605 D Avenue N. W. Cedar Rapids, Iowa

Sold and Distributed by Leading Construction Machinery Dealers Throughout the United States and Foreign Countries

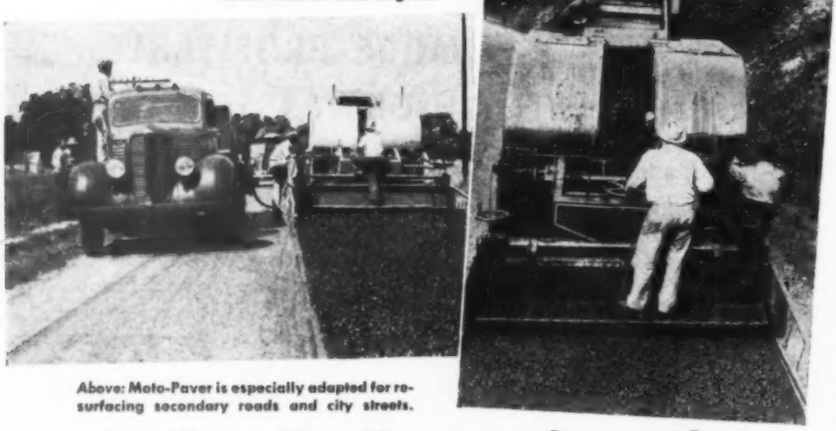
MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

Kilroy Service Outfit Shown with Inventor John H. Adler

tanks built into the channel members and trailer chassis. On each side of the tank assembly is a battery of 9 hose reels for dispensing diesel fuel, gasoline, water, diesel lube oil, gasoline lube oil, air, chassis grease, track roll, and gear oil. The unit has a 60 cu. ft. gas driven air compressor. All operations from fueling to filling radiators are air controlled and operated. Explosion-proof air motors dispense both fuel and lubricants, and, by means of pressure regulators on each of 18 service outlets, pressures ranging up to 7,000 lb. psi. may be maintained on individual outlet, thus assuring selective pressures for bearings being serviced.


# The Moto-Paver Does the Complete Mixing and Paving Job

*At right:* Resurfacing old macadam road in West Virginia.



Above: Moto-Paver is especially adapted for resurfacing secondary roads and city streets.

## In One Continuous Operation

Above: Aggregate may be dumped directly from trucks into front hopper, as shown here, or picked up from windrow, using an H & B Mate Loader.

● Moto-Paver, the complete traveling mixer and paver, delivers, spreads and strikes off the mixed material on the road surface—ready for rolling. The strike-off blade is adjustable to hold accurately to the specified grade and crown—producing a smooth, non-wavy surface even when resurfacing over rough or irregular pavement. The Moto-Paver has been successfully operated using gravel, stone or slag aggregates, and with most types of emulsions including RC, MC and SC asphalt and tars. Bulletin MP 47 sent on request.

HETHERINGTON & BERNER INC.
721 Kentucky Ave., Indianapolis 7, Ind.

H&B Moto-Paver
THE COMPLETE TRAVELING MIXER AND PAVER


## 15

## New Line Marker

A low-priced companion to its De-Lux portable line marking device has been announced by Universal Sales & Mfg. Co., Southgate, Calif. The Junior is designed for use where the area to be covered is fairly small, but where neat, clean lines are needed to enhance appearance and safety. The Junior is easy to operate, painting bold lines while pushed at walking speed. It is easily cleaned by merely flushing container, valve and brushes with gasoline or thinner. The pure hog bristles may be easily replaced by the operator when necessary. The all metal design lends sturdiness with lightness, minimum weight being 3 lb. This device is highly flexible and can be used with equal facility for marking lines or lettering a variety of simple pavement signs.

Junior Line Marker

## 16

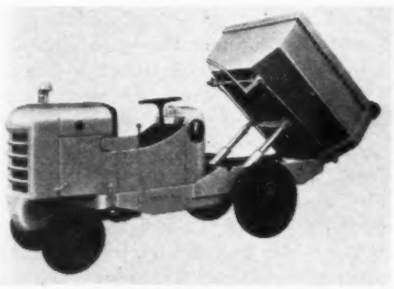
## New Hard-Surfacing Electrodes

A new group of hard-surfacing electrodes has been announced by Harnischfeger Corporation, Milwaukee, Wis. Named "Hartop" there are four electrodes in this new P&H series: Brown, Green, Red and Yellow. They cover the Rockwell C range of from 35 to 63 (as deposited). Har-

top Brown provides a 35 to 40 Rockwell C Hardness and is for welds subject to angular shock and abrasion. Deposits won't chip or spall along edge from glancing blows or sudden loading. Hartop Green is designed for high resistance to impact and abrasion. It provides strong bonds on carbon and alloy steels manganese steels, and cast iron. Rockwell C Hardness is 45 to 50. P&H Hartop Red is for severe impact and abrasion and is excellent wearing with high resistance to shattering impact. Rockwell C Hardness is 50 to 55. The fourth P&H electrode of this new hard-surfacing group is Hartop Yellow with a Rockwell C Hardness of 58 to 63, its deposits resist abrasion and deformation caused by weight and impact.

## 17
## New Hauling Unit

A new addition to its line of material handling equipment, the "Payloader Buggy," has been announced by Frank G. Hough Co., Libertyville, Ill. It is a gasoline engine powered 4-wheel, pneumatic-tire hauling unit



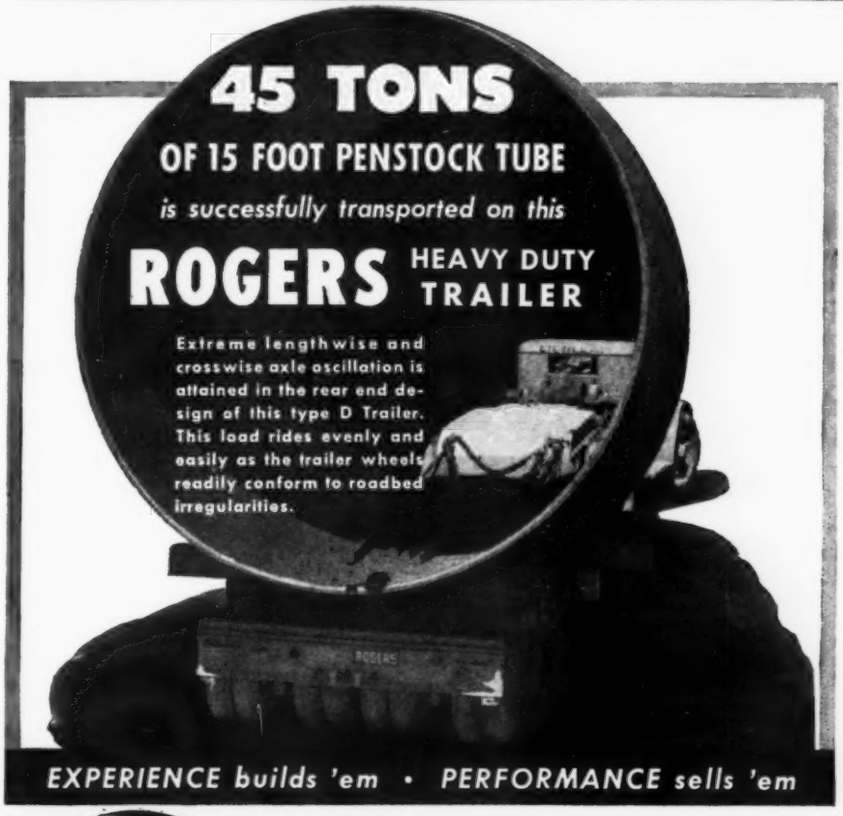
Payloader Buggy

with a 2 cu. yd. capacity, hydraulically-dumped body. Built as a companion to the Payloader Shovel, the Payloader Buggy matches it in capacity, compact size, speeds and operation. In addition all main parts of this buggy are interchangeable with those of the Model HA Payloader Shovel.

## 18
## New Portable All-Steel Tool Box

A new all-steel tool box, manufactured by Littleford Bros., Inc., Cincinnati, O., is of welded construction and claimed to be absolutely fire-proof, weather-proof and thief-proof. Patented locking cover prevents anyone from tampering with tools. Safety catch holds covers in open position with no fear of dropping on workmen's hands. The box can be left on the job as locking chains keep box from being trailed. While on the job, adjustable legs keep the box steady,

DIETZ
LANTERNS
DEPENDABLE LIGHT for Over a Century
DIETZ No 87 TORCH MADE IN U.S.A.
ALSO DEITZ TORCHES
R.E. DIETZ COMPANY
EST. NEW YORK 1840
OUTPUT DISTRIBUTED THROUGH THE JOBBING TRADE EXCLUSIVELY


45 TONS
OF 15 FOOT PENSTOCK TUBE
is successfully transported on this
ROGERS HEAVY DUTY TRAILER
Extreme lengthwise and crosswise axle oscillation is attained in the rear end design of this type D Trailer. This load rides evenly and easily as the trailer wheels readily conform to roadbed irregularities.
EXPERIENCE builds 'em • PERFORMANCE sells 'em
ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
110 ORCHARD ST. ALBION, PENNA.

"Han Dee Box"

make it possible to cut and thread pipe, etc. Caster wheel is furnished to move box while on the job. This wheel folds under the box when trailing. Sliding shelves are divided into compartments for housing first aid kits, records, files, small tools, fittings, etc. Brackets and lugs are provided for storing tools.

Pioneer 145R Crushing and Screening Plant

## 19
## New Crushing and Screening Plant

A new semi-portable crushing and screening plant, announced by Pioneer Engineering Works, Inc., Minneapolis, Minn., is a duplex plant having a 1524 jaw crusher and a 30 x 18 roll crusher, together with folding bucket elevator and power unit, all mounted on a structural steel chassis with steel wheels. Pneumatic tires are optional. Additional units consist of a 3-deck, 3-ft. x 10-ft. vibrating screen mounted atop a 20-cu. yd., 3-compartment steel storage bin, and a return conveyor from the screen to the roll crusher. For moving, the bucket elevator is folded over the crusher units and the screen, bin and return elevator are loaded on trucks. The plant is rated at a normal capacity of 40 to 50 tons per hour of three sizes of material. The hopper fed primary crusher will take rock up to 12 in.

**with OSGOOD Air Control**

Smooth, effortless steering—without stopping the forward motion of the machine—with the cab in any position—that's OSGOOD Air-Controlled Steering! Independent air cylinders, actuated by a small lever in the cab, disengage and set steering brakes on the driving sprockets instantly, eliminating the need to hunt for a point where a steering lock can be engaged.

OSGOOD Air Control means faster, safer operation . . more work done in less time, with less effort. Plan now to choose an OSGOOD . . a complete line of power shovels, draglines, cranes, clamshells, backhoes and pile drivers . . a model for every type of work.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO. EXCAVATOR

MARION OHIO

DIESEL, GASOLINE OR ELECTRIC POWERED • ⅜ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES


## 20
## New Air Hose

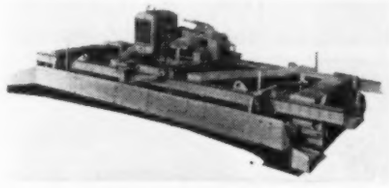
Following exhaustive tests at Granby Dam in Colorado and other construction projects, Goodyear Tire & Rubber Co.'s mechanical goods division, Akron, O., has announced the development of a new type tread-

Redwing Air Hose

stock cover for its Redwing air hose line. The new hose cover utilizes a cushioning stock similar o that developed recently by Goodyear compounders for tire treads. Softness of this heavy gauge stock is stated to afford maximum resistance to extreme abrasion and gouging. The hose is reinforced with a cabled cotton body for greater carcass strength and flexibility, and the seamless tube is unaffected by lubricants. Manufactured in two types—2-braid standard for pneumatic tool service and 3-braid heavy duty for air drill usage —hose sizes range from ⅜ in. to 1½ in. in 25-50 ft. lengths or 450-ft. reels.

## 21
## New Concrete Paving Finisher

An improved concrete paving finisher, introduced by Blaw-Knox Co., Pittsburgh, Pa., has independent control of traction and screed speeds and other refinements. The improved model is identified as Model XE and replaces the Model XC. The independent control of traction and screeds is provided by a new automotive type transmission, which also simplifies the

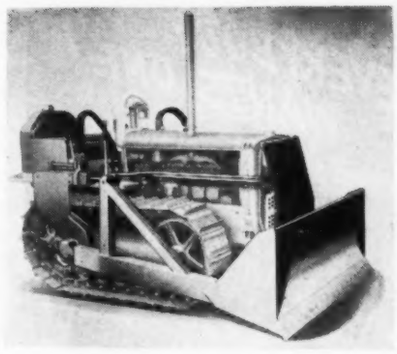


Model XE Finisher

controls. Now available to the operator are 16 combinations of screed and traction speeds as against four combinations on the older model. The improved finisher is equipped with a larger engine, a Continental PF-162, which generates 27 hp at 1250 rpm without the vibratory paving attachment, or 32.5 hp at 1620 rpm with the vibratory paving attachment. Another new feature is a V-belt drive with automatic take-up to absorb the shock of starting and stopping, reduce maintenance and contribute to more quiet operation. The steering and brake control mechanism has been simplified; a new adjustment is provided on the chain drives from the transmission to the horizontal traction driveshafts and improvements have also been made in the hydraulic screed lifting system.

## 22
## New Bulldozers

Two new hydraulic controlled bulldozers, designed for exclusive use with the D2 track-type tractor, have been placed in production by Caterpillar Tractor Co., Peoria, Ill. The new earthmoving tools, the No. 2A, angling blade, and the No. 2S, straight blade, bulldozers are the first designed for use with and matched in capacity to the power of the D2 tractor. The No. 2A bulldozer has a blade length of 80 in. for the 40-in. gauge D2 tractor and 97½ in. for the 50-in. gauge tractor. It has a maximum lift, with blade straight, of 28 in., or the front point of the blade with lift 32½ in. for the 40-in. gauge and 34 in. for the 50-in. gauge when the blade is angled but not tilted. It has an 11-in. drop below the ground, a blade angle of 25 degrees and a maximum tilting adjustment of 6 in. The No. 2S bulldozer, offered also for the 40-in. gauge



|2S Bulldozer or Diesel D2 Tractor (Tractor Phantomed)


# MUD-JACKING IS REDUCED TO ONE OPERATION with BITUCOTE

**Mud-jacking has become—not only a single, simple job—but also it's the *last* time that slab needs to be leveled when it's properly done with non-volatile, safe Bitucote asphalt emulsion... It's used unheated and it's non-hazardous.**

**Added to the slurry, pressure-pumped under the slab, it *cures* and *dries* there as a permanent, stable, water-resistant sub-base that *forms its own seal* right to the top surface of the slab. This *seal*—plus stability and resistance to impact and compression—*stops pumping*.**

**Mud-jacking takes on greater practicability, safety and importance with Bitucote - stabilized slurry—and it's economical and time-saving, too.**

Bitucote PRODUCTS CO.

Send for Bitucote improved procedure for one-operation mud-jacking.

*Get more of the advantages of asphalt with Bitucote Emulsion!*

1411 CENTRAL INDUSTRIAL DRIVE • ST. LOUIS 10, MO.
*Plants in: Cincinnati, O. • St. Louis, Mo. • El Dorado, Ark.*

get your copy from your LE-HI distributor NOW, while his supply lasts! . . .

Here is REAL information about hose couplings — how to buy them, how to install them, how to use them, how to get the most out of your equipment. Facts that will save you *time* and money. Handy size — just right for your pocket.

If you buy or use hose couplings, you should have this book!

Remember, LE-HI Hose Couplings and Fittings are sold only through leading distributors and rubber manufacturers. *If you don't know the name of your nearest LE-HI distributor, write us direct!*

*Remember . . .*
**LE-HI MAKES A GOOD CONNECTION!**
LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS
**HOSE ACCESSORIES CO.**
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and 50-in. gauge D2 tractors, has a blade length of 68 in. for the 40-in. gauge and 80-in. for the 50-in. gauge. It has a maximum lift of 25 in. and a drop of 10 in. below the ground.

## MANUFACTURERS' LITERATURE

### 23
### Gas Welding Wire

A new Page gas welding rods catalog, has been released by Page Steel & Wire Division, American Chain & Cable Company, Inc., Monessen, Pa. This 24-page brochure is devoted exclusively to gas welding wire and its use. It covers the complete Page line; gives the application, procedure, proper torch adjustment, physical properties, etc., of each gas welding rod. And on the back cover, there's a convenient reference chart, "Page Welding Electrodes and Gas Welding Rods." Numerous application photographs are shown throughout the booklet.

### 24
### Wire Rope Connectors

Its complete line of Electroline-Fiege wire rope connectors is featured in a new 38-page catalog issued by Electroline Co., Chicago, Ill. Generously illustrated with cut-away views to show how cable and strands are positively anchored, the catalog includes a condensed analysis of the three main types of connection—open end or clevis type, eye end type and stud end type; with all dimensional specifications and simple illustrated instruction material covering installation.


**TRANSITS and LEVELS**
**HEADQUARTERS for REPAIRS – any make**

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

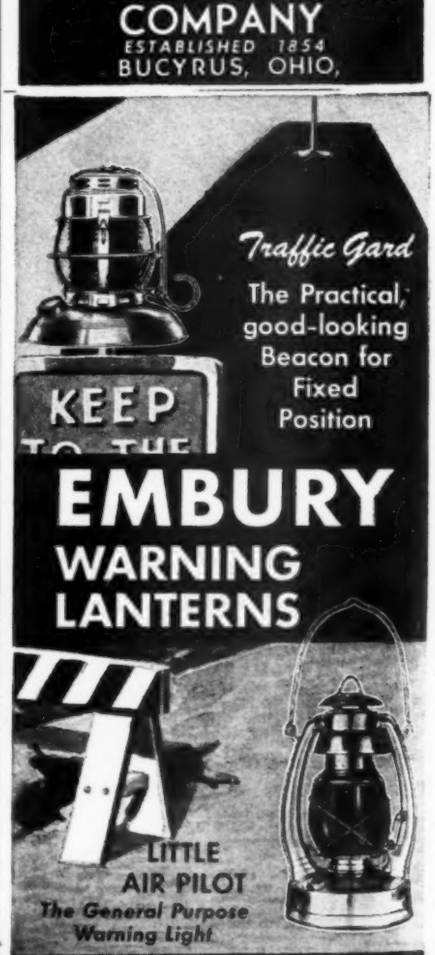
Write for new Catalogue RS-43, of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

**WARREN-KNIGHT CO.**
Mfgrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.

**Shunk Snow Plow and Ice Removal BLADES**

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.
FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.
SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

**Shunk MANUFACTURING COMPANY**
ESTABLISHED 1854
BUCYRUS, OHIO,




*Traffic Gard*
The Practical, good-looking Beacon for Fixed Position

**EMBURY WARNING LANTERNS**

LITTLE AIR PILOT
*The General Purpose Warning Light*
*Order through Your Jobber*
EMBURY MFG. CO., WARSAW, N. Y.

## 25
## Hydraulic Products

A comprehensive catalog on its hydraulic power control units, pumps, valves, motors and cylinders has been issued by LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Ia. Mechanical features of the various units are illustrated and described. Installation data accompanied by drawings are given and performance data are shown by charts. The hydraulic power control units are available in four sizes, 15, 25, 40 and 60 GPM capacity. The hydraulic cylinders are available in 4-in, 5-in. and 6-in. diameters. The hydraulic pumps are available in three sizes, HP 25, HP 40 and HP 60. The gear type fluid motors are available in four sizes, HM-15, HM-25, HM-40, HM-60.

## 26
## Truck Loader

A truck loader operated by the truck driver from his cab is featured in a folder issued by Shoveller Corporation, Portland, Me. Power for filling the bucket and dumping it in the truck is furnished by the traction of the truck's rear wheels on the loader's pads. No power take-off is required.

## 27
## Portable Power Saws

Lightweight gasoline engine power saws are illustrated and described in a circular of Moll Tool Co., Chicago, Ill. Three types of saws are covered: Model 30 circular saw, new Model 7 chain saw and Model 7 bow chain saw. Illustrations and specifications of the saws are included.

# WITH THE MANUFACTURERS & DISTRIBUTORS

### New Gradall Distributors

The Gradall Division of Warner & Swasey Co., Cleveland, O., has appointed the following distributors for Gradall: J. P. Waite Inc., 3304 West Pierce St., Milwaukee, Wis., for Wisconsin and the upper Peninsula of Michigan. J. C. Georg, Syracuse, N. Y., for eastern New York state with the exception of metropolitan New York City.

### Joins Pennsylvania Refining

D. A. "Red" Fassas of Lexington, Ky., has recently joined the sales force of Pennsylvania Refining Co., Cleveland 4, O., the refiners and manufacturers of Penn Drake products. He will handle all classes of accounts in Kentucky and Southern Ohio.

### New Richkraft Representative

Jason D. Radding has been appointed sales representative for The Richkraft Co., Chicago, Ill., in Maryland, Eastern New York, Eastern Pennsylvania, New Jersey and the New England states.

### Appointed Special Representative

E. E. Witt

E. E. Witt has been appointed special representative in construction and industrial sales for Caterpillar Tractor Co., in the Western division. With headquarters in San Leandro, Calif., he will serve as a consultant to West Coast distributors of "Caterpillar" equipment on construction and earthmoving equipment and its application.

Eight cubic yard Marion Rock Body for off the highway use, designed for and used in leading cement company quarries.

# MARION
## DUMP BODIES and HYDRAULIC HOISTS

**Marion Bodies and Hoists are "Designed On The Job" to meet actual work conditions, by engineers with the field experience and the practical "know-how" to solve "tough-nut" loading, hauling and dumping problems.**

**There is a Marion Body and Hoist for every hauling job. . . designed to fit all makes of truck chassis. Write direct, or to your nearest Marion Distributor, for literature, prices and information.**

**MARION METAL PRODUCTS CO., MARION, O.**

# CLEARING HOUSE

**DEPENDABLE USED MACHINES FOR SALE**

4 ft. Symons cone crusher. Pioneer 24x18 roll crusher. Universal 9x16 jaw crusher. Brownhoist gas loco. crane. General ½ yd. shovel. Int. I-4 with Hough shovel.

**TRACTOR & EQUIPMENT CO.**
3521 W. 51st St. Chicago, 32

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***Available for immediate delivery, rental or purchase, at very attractive price***

Two Wooldridge Terra-Cobra self-powered Scraper units, 15 yards struck, 18 yards heaped; Cummins Diesel Engines with less than 200 hours on either machine.

**Box 118, Care of Roads & Streets**
**22 West Maple St., Chicago, Ill.**

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**FOR SALE**

One new unused Etnyre Road Oil Distributor Complete. No truck under it.

**Price $5250.00**

**CHARLES B. SNYDER**
Box 1952 Great Falls, Montana

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**STEEL STORAGE TANKS**

6—6000 & 10,000 GAL. R.R. CAR
2—15,000 GAL. WITH COILS
12—NEW 42,000 GAL. CAP.

**L. M. STANHOPE, Rosemont, Penna.**

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**FOR RENT**

Approximately 100 ton of New Bethlehem Section AP-3 Sheet Piling in 60' lengths.

**A. S. WIKSTROM, INC.**
Skaneateles, New York

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20—NORTHWEST SHOVELS, Model 25, with Trench-Hoe, Dipper and Crane attachments, Caterpillar D-4600 Diesel Engines, practically new.

***For Sale or For Rent***

**KEN ROYCE INC.**
185 Bayshore Blvd. San Francisco 24
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**TRANSITS and LEVELS**

***New or Rebuilt***

***Sale or Rent***

Headquarters for REPAIRS—any make. Factory service. We will also buy your old instruments or take them in trade.

A complete line of engineering Instruments and Equipment for Field or Office. Write for Bulletin RS-142.

**WARREN-KNIGHT CO.**
*Manufacturers of Sterling Transits and Levels*
136 N. 12th St. Philadelphia 7, Penna.

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**FOR SALE**

**1—Austin Power Pickup Sweeper**

7'0x3' rear broom, 42" gutter broom, pneumatic tires, sprinkler system ..... $1,800.00

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**WHAT A BARGAIN ROME 404 TANDEM**

Drive Patrol—Serial No. 404-740—Hercules Diesel Power—12' Blade—V Type. 13 Tooth Scarifier Attachment. Used About 5 Months

**Net Price—F.O.B. Oklahoma City**

**$6125.00**

*WIRE — WRITE — CALL*

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**FOR SALE**

1—Factory Rebuiltt Model 48-B Bucyrus-Erie Combination Clamshell Dragline with 60' Boom. Serial No. 12291. Powered by Model 6-D-1742 Buda Diesel Engine. Good Condition—Price $22,500:

**HAMPTON ROADS TRACTOR & EQUIPMENT COMPANY**
W. 39th Street & Killam Ave.
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**DEPENDABLE USED MACHINES**

Butler Carscoop.
Browning 20-ton crane.
Pioneer 16-V road gravel plant.
Osgood Model 200 backhoe.
Carter 4" pump.
Truck crane on 10 pn. tires.

**TRACTOR & EQUIPMENT CO.**
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**FOR SALE**

Detroit Sweeper, Serial NL5002, hydraulically operated. Recently used on Ford-Ferguson Tractor. Cost new $500. In good serviceable condition with new rotary broom. Price, subject prior disposition, $300.00.

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**PORTABLE GREASE DISPENSER**
**Another War Surplus Bargain**

Brand new in original crates, tested and guaranteed; Fully portable, powered by gasoline engine, provides on-the-job high-pressure and/or gear box lubrication for heavy equipment. Made by Alemite Div. of Stewart-Warner Corp. Write for details.

**WAR SURPLUS ENGINEERING COMPANY**
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| **Rex Model 27E Paver—Serial G940E** | **$2500.00** |
| **McKiernan-Terry Pile Hammer—Serial 10361 with steel leads. New 1947** | **2500.00** |
| **50 KW Diesel Generating Set—International VD 18 6 cyl. 100 HP Diesel. New condition** | **4000.00** |
| **315 cu. ft. Schramm Diesel Powered Air Compressor—Serial 450719** | **3500.00** |
| **Buffalo Springfield Roller, 10-ton—Serial 15906** | **2500.00** |
| **1 yd. P & H Dragline with bucket—1927 Machine, as is** | **4500.00** |
| **Whitcomb Locomotive No.11307—30 ton—as is, Standard Gauge** | **3500.00** |

**MANITOU CONSTRUCTION CO.**
Rochester 4, New York

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**SIMPLIFY COMPUTATION OF VERTICAL CURVES**

Let E-Z-V-C Tables do the work for you. Compute vertical curves from 10 to 2,000 feet in length accurately, and in half the time.

Single booklet $1.00. One dozen $7.50.

**P. O. BOX 3278, ST. "F"**
**E-Z-V-C TABLES Atlanta, Ga.**

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**FOR SALE**

2—Late Model 4½-HM Jaeger, slightly used 4½ yard Truck Mixers in A-1 condition. Price each $4,350.00.

**NORTH CAROLINA EQUIPMENT COMPANY**
3101 Hillsboro Street , Raleigh, N. C.
Telephone—8836

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**PORTABLE HEATER**
**War Surplus Bargain**

Type D-1 Stewart-Warner ground heater. Produces 100,000 BTU/HR.—All gasoline driven—Absolutely no fumes. Priced $250 FOB our warehouse in Missouri. Send cash, check or money order to

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**FOR SALE**

RD8 Caterpillar Tractor, equipped with Caterpillar PCU, Canopee Top and Push Pan, also LeTourneau "U" Wagon, all in good condition to be sold as unit.

**CARL GOODWIN & SONS**
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**HEAVY EQUIPMENT AUCTION**

Offering for highest bidder—
Caterpillar Motor Grader #12
D-8 Tractors
D-18 Tractors
and other heavy construction equipment.
For further information, write

**FRANK EBLEN CONSTRUCTION CO.**
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**FOR SALE**

Waterproof—High wet strength. Sub grade paper.

**PROTECTIVE PAPERS**
Union, Illinois

## Promotional Material for Road Show

Harvey A. Scribner, Chairman of the Promotion Committee for the 1948 Convention and Road Show, has announced that the committee now has available advertising material which manufacturers and dealers can use to aid in promoting the show. There are small cuts for use in manufacturers' and dealers' advertising, stickers for use on letterheads and other mailing material, envelope stuffers and reprints. The committee would like very much to have manufacturers and dealers take part in the promotion of the show by using as much of this material as possible. Complete information and samples can be secured from the American Road Builders' Association, International Building, Washington, D. C.

## Proposes Change of Name

A proposal to change the name of The American Rolling Mill Co. to Armco Steel Corporation will be submitted to shareholders for consideration at their annual meeting on April 15, 1948, Charles R. Hook, president, has announced. Mr. Hook said that the change in name had been under consideration for some time. "The proposed new name utilizes the company's well-known trade name 'Armco,' and at the same time indicates that it is a steel company," he stated.

## Top Management Changes

Charles S. Munson, formerly president of Air Reduction Co., Inc., New York, N. Y., has been elected chairman of the executive committee. He is succeeded by John A. Hill, who becomes the fifth president of the company. William C. Keeley, formerly vice president, was elected chairman of the newly created finance committee. C. E. Adams remains chairman of the board of directors.


*A pointer on a fast job!*

Sauerman Slackline Cableway with tall anchorage nearly 1500 ft. away from mast, scoops gravel from bar in bend of river and hauls over 100 tons an hour to plant.

→ ***with* Sauerman Long Range**
**POWER SCRAPERS and SLACKLINE CABLEWAYS**

→ You save time, labor and power when you use a SAUERMAN machine to do a long haul job of material moving . . . and the net results always are pleasing. All over the world SAUERMAN Long Range Scrapers and Cableways are solving dig-and-haul problems and making savings over estimated costs. Installation is simple. Power and maintenance items are small.

**Let Our Engineering Department Advise You**

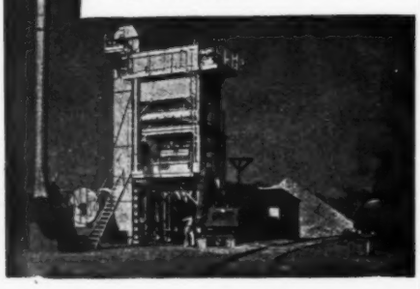
There is a type of SAUERMAN Machine to meet your specific problem. For digging in wet or dry ground, from pond, river or pit; also for picking up and moving all kinds of materials, and handling stockpiles. Operation by either electric, gasoline or Diesel power. From long experience we will be glad to recommend suitable equipment for your job. Catalog showing typical installations will be sent on request.

→ **SAUERMAN BROS., INC.**
588 S. Clinton St. Chicago 7, Illinois


## Mack Truck Appointments

A. C. Fetzer, Vice-President and General Sales Manager of Mack Trucks, Inc., has announced the following appointments: C. E. Cole has been made district manager in charge of the Los Angeles Branch, with headquarters at 1501 South Central Ave. Lawrence D. McLean has been appointed district manager in charge of the Reading (Pa.) Branch, located at 1212 Moss St. T. H. Jones has become district manager in charge of the Charlotte (N. C.) Branch, with offices at 1400 South Mint St. William Dudde has been named district manager in charge of the Bronx (N. Y.) Branch.


**PORTABLE ASPHALT PLANTS**
**High Production—Low Cost**



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VULCAN PAVEMENT AND CLAY DIGGING TOOLS

**ARE MADE in a complete line of sizes to fit all standard compressed air hammers.**

*Send for NEW Vulcan illustrated CATALOG today.*

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VULCAN TOOL MFG. CO.
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*CONTRACTORS RUBBER PRODUCTS*
available from Stock for immediate Delivery

**CONVEYOR, ELEVATOR and TRANSMISSION BELTING**
all widths and plies

**V-BELTS** all sizes

**HOSE**
all sizes and types

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| AIR | DISCHARGE | STEAM |
| FUEL | COMPRESSOR | VACUUM |
| FIRE | PILE DRIVERS | SUCTION |
| WATER | ROAD BUILDERS | WELDING |

**BOOTS, DREDGE SLEEVES, PUMP DIAPHRAGMS, ETC.**

. . . and everything rubber for Industrial Requirements

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Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

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American Cable Division ..... Third Cover
Amer. Road Builders' Assn. ..... 60
Amer. Steel & Wire Co. ..... 89
*Austin-Western Co. ..... 16-17

*Barber-Greene Co. ..... 76
*Bethlehem Steel Co. ..... 1
Bitucote Products Co. ..... 125
Blackhawk Mfg. Co. ..... 41
*Blaw-Knox Co. ..... 27
*Bros Boiler & Mfg. Co., Wm. ..... 52
Bucyrus-Erie Co. ..... 63

Carlyle Rubber Co. ..... 129
Caterpillar Tractor Co. ..... 7
Ceco Steel Products Corp. ..... 4
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*Advertisers with * are represented in the 1947 edition of Powers Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

Check other products below on which you wish us to obtain information for you:

AGGREGATE:
- ☐ Bins and Hoppers
- ☐ Conveyors
- ☐ Crushers
- ☐ Portable Plants
- ☐ Screens

BITUMINOUS:
- ☐ Batchers
- ☐ Finishers
- ☐ Distributors
- ☐ Dryers
- ☐ Heaters
- ☐ Plants (central)
- ☐ Plants (travel)

CONCRETE:
- ☐ Batchers
- ☐ Buggies and Carts
- ☐ Finishers
- ☐ Joints, Expansion and Contraction
- ☐ Reinforcement Accessories
- ☐ Metal Road Accessories
- ☐ Mixers (under 1 yd.)
- ☐ Mixers (1 yd. up)
- ☐ Pavers
- ☐ Reinforcing Steel
- ☐ Road Forms (1000' set)
- ☐ Tower
- ☐ Truck Mixers

CRANES:
- ☐ Crawler Mounted
- ☐ Truck Mounted
- ☐ Piledrivers

GRADERS:
- ☐ Blade, self propelled
- ☐ Blade, pull type
- ☐ Blade, under truck
- ☐ Elevating

GUARD:
- ☐ Highway

LOADERS AND TRENCHERS:
- ☐ Front-end loader (tractor mounted)
- ☐ Loader, bucket type and belt type
- ☐ Trencher or Ditcher

HAULING EQUIPMENT.
- ☐ Dump Truck, self-powered
- ☐ Dump Wagons, tractor drawn
- ☐ Flatbed Trailers

PUMPS:
- ☐ Centrifugal
- ☐ Concrete
- ☐ Diaphragm
- ☐ Mud Jacking
- ☐ Piston
- ☐ Wellpoint

POWER UNIT: (Independent)
- ☐ Gasoline
- ☐ Diesel
- ☐ Electric

ROLLERS:
- ☐ Power (Smooth)
- ☐ Pneumatic Tire
- ☐ Sheepsfoot

TRACTORS:
- ☐ Crawler
- ☐ Rubber-Tired

TRACTOR EQUIPMENT:
- ☐ Dozers
- ☐ Power Control Units
- ☐ Rippers
- ☐ Scrappers, tractor drawn
- ☐ Scrapers, self-powered

BUCKETS:
- ☐ Clamshell
- ☐ Concrete
- ☐ Dragline
- ☐ Orange Peel

SHOVELS AND DRAGLINES:
- ☐ Crawler (under 1 yd.)
- ☐ Crawler (1 yd. up)
- ☐ Truck Mounted

ROCK DRILLS AND AIR TOOLS:
- ☐ Air Compressors
- ☐ Backfill Tampers
- ☐ Clay Diggers
- ☐ Concrete Vibrators
- ☐ Drills, cable tool
- ☐ Drills, tripod and wagon
- ☐ Drills, rock, hand-held
- ☐ Paving Breakers
- ☐ Riveters and Chippers

MISCELLANEOUS:
- ☐ Buildings, portable
- ☐ Earth Drills, power
- ☐ Light Plants
- ☐ Lubrication, Service Truck
- ☐ Mowers, Highway
- ☐ Power Saws
- ☐ Soil Stabilizing Equipment
- ☐ Snowplows, rotary
- ☐ Snowplows, v or wing
- ☐ Spreaders, sand
- ☐ Street Flushers
- ☐ Street Sweepers
- ☐ Welders
- ☐ Cutting Torches
- ☐ Hydraulic Jacks
- ☐ Hydraulic Control Equipment
- ☐ Hand Tools
- ☐ Hoists, derrick type

Be sure to fill in name and address below:

Your Name ..... Title or profession .....

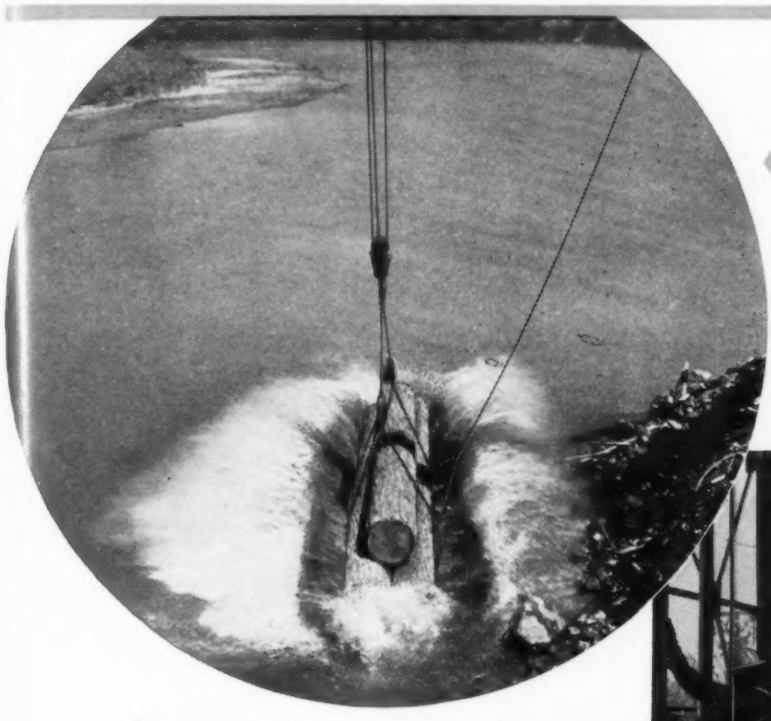
Name of your company or governmental department .....

Type of work for which equipment will be used .....

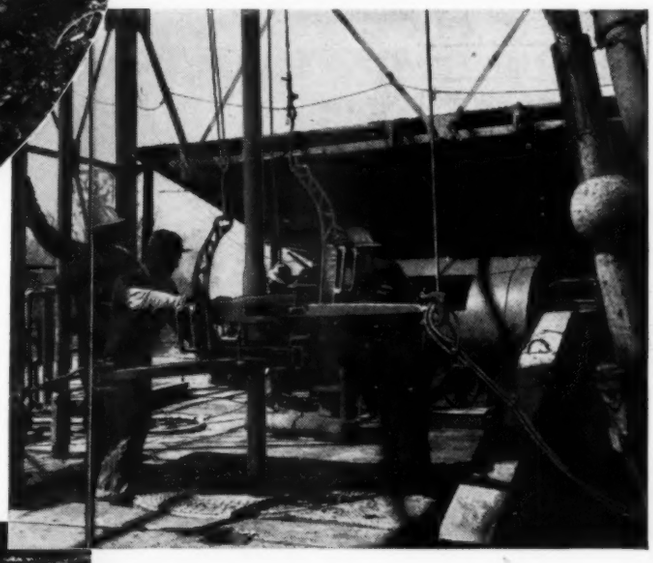
Street Address .....

City ..... State ..... County .....

# Improving Production with LAY-SET PREFORMED



**Dropping logs** into the river with a swing boom unloader. When logs hit water an automatic trip on the hooks frees the mainline straps. Buoyancy of logs in water slacks the mainline, and weight jerks hooks free from strap loops. With a load of 5,000 board feet (40,000 pounds), that's a lot of lifting, jerking and quick-slackening for the wire rope—but Hazard LAY-SET Preformed takes it in stride.



**In oil drilling**—Improved production with LAY-SET Preformed wire rope is quickly evident in the oil fields. Because LAY-SET is a "relaxed" wire rope, it takes bending stresses, whipping and straining—with ease. The result is fast, uninterrupted production—more barrels of oil per day.

**Short wall cutting** machine at work in a coal mine. Here, where wire rope failures would seriously affect production, operators depend upon LAY-SET Preformed wire rope. Its longer life means steadier, more profitable production.

***LAY-SET** Preformed wire rope will improve production on your lifting and pulling jobs too. Be sure to specify* LAY-SET Preformed *the next time you need wire rope.*

**ACCO** *In Business for Your Safety*

**HAZARD WIRE ROPE**

**A DIVISION OF AMERICAN CHAIN & CABLE**

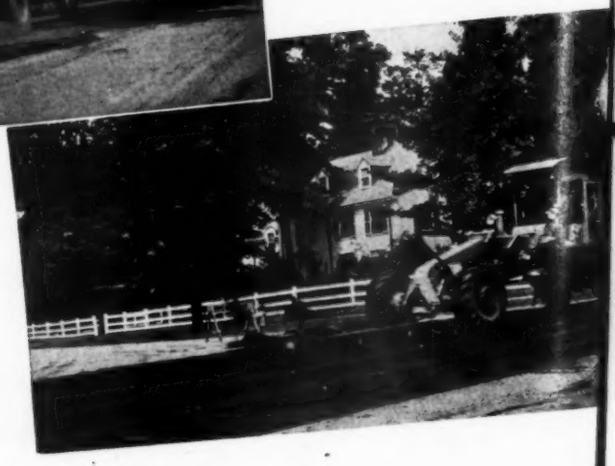
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.

# West Hartford streets owe their well-groomed look

## to these 3 steps

Applying Texaco Medium-curing Cutback Asphalt to one of many streets in West Hartford, Conn.

Spreading a uniform covering of sand over the Cutback Asphalt.



Honing the street to achieve thorough mixing of the Cutback Asphalt and sand.

West Hartford, Conn., is more "street conscious" than the average town. As the result of close attention to maintenance, its streets invariably are smooth, dustless and attractive, well-suited to the beautiful homes they serve.

A Texaco Cutback Asphalt of the medium-curing type was used on a large portion of the West Hartford street system last year. When covered with sand and honed as shown by the photographs, this Texaco asphaltic material forms a tough, waterproof, skid-resistant mat, low in cost and adequate for fairly heavy residential traffic.

Refined from carefully selected crudes for over 40 years, Texaco Asphaltic products include a material exactly suited to every street construction and maintenance need. A Texaco representative who is an Asphalt specialist will help you choose the asphalt improvement which offers the best and most economical solution to your street paving or repair problem. Write our nearest office if you would like him to call and discuss your problem with you. He is at your service without obligation.

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TEXACO REG. T. M.

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